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THE national importance of a well organized Veterinary Department has been fully demonstrated recently by the prompt measures taken to deal with the recent outbreaks of foot-and-mouth disease in Great Britain and Ireland, and the value of such a department to stock-owners cannot be overestimated. That a keen and capable man should be appointed as head of the department is an essential factor, for a wrong order issued from headquarters might mean a blunder which would cost the country many thousands of pounds.

That Mr. Prentice possesses these qualifications to a marked degree is shown by the fact that upon the death of the late Mr. Hedley, he was immediately selected to succeed him, and his exceptionally friendly yet firm relations with the veterinary inspectors of Ireland prove that he is the right man in the right place.

Graduating from the Irish Veterinary College in 1882 he was appointed in the same year as a veterinary inspector to the Veterinary Department of Agriculture and Technical Instruction for Ireland; in 1888 he was promoted to be Travelling Inspector, and afterwards Superintendent Transit Inspector, from which position he became Chief of the Staff. His duties are onerous and his responsibilities great, but he has proved that he does not shirk them, and although the breeders and owners of Ireland hope that he may never have abnormal chances of exercising his powers they feel that in his hands the welfare and health of their cattle are as safe as is humanly possible.

Editorial.

THE LEGAL LIABILITY IN CASES OF HONEST OPINION.

Twice recently have veterinary practitioners been summoned as defendants, in conjunction with horse-owners or horse-keepers, when their opinion has been given that the animal is fit for work, and as the annoyance is serious it behoves us well to consider our position. In one case in particular the animal had had chronic lymphangitis for more than two years, and, although unsightly from the enlarged appearance of the thick leg, was much better at work than standing in the stable. Apparently all right one day, and ordered to work by the practitioner, this animal was stopped by the police two days later, with no lameness but quite justifiably, on account of a palpably fresh sore on the leg (the result of an abscess), but the veterinary surgeon who had examined it two days before and had detected no sore or swelling to be present then, was also included in the charge. Needless to say, that after his evidence, and that of several of his veterinary confrères, the charge against him was dismissed, but the result by no means compensated for the anxiety, annoyance and loss of time which he had been caused. As bearing on the point the opinion of Mr. Justice Channell, as reported in the Law Reports, 2 Queen's Bench Division, 1898, page 641, the case of Benford and Sims is worth quoting as it gives a certain amount of consolation to those who may become unfortunate victims. In the concluding sentence of his judgment he says:—

"I must point out that our decision on . . . affords no ground whatever for supposing that a veterinary surgeon who gives a wrong opinion and commits an error of judgment is liable to be convicted of cruelty if the effect of his opinion being followed is that the act of cruelty itself in fact results."

Let the practitioner recollect this and refer it to the notice of his solicitor if ever misfortune of this nature overtakes him, and the fact that such is likely any day to occur is a strong argument for the membership without delay of the National Veterinary Defence Society, the advice of whose committee is always willingly given when asked for.

General Articles.

A REPORT ON FOOT-AND-MOUTH DISEASE IN IRELAND IN 1912 TO THE DEPARTMENT OF AGRICULTURE AND TECHNICAL INSTRUCTION FOR IRELAND.

(Abstracted.)

(Continued from p. 73.)

HAVING regard to the fact that the in-contact animals were being shipped to Great Britain, it was considered proper to at once apprise the Board of Agriculture and Fisheries of the details of the case, and, if desired by the Board, to forward the tongue of the bullock for examination by their veterinary officers. On this being done the Board requested the tongue to be sent to them, and on its receipt they telegraphed to the Department to the effect that the Chief Veterinary Officer was of opinion that the animal to which the tongue belonged suffered from foot-and-mouth disease a month or two previously, that the lesion could have arisen from no other disease, and that acute lesions of the disease might occur in cattle in contact with the bullock in question. The cattle on arrival at Dundee were consequently detained for a prolonged period in quarantine, in anticipation of disease appearing among them. The animals, however, remained healthy, being subsequently distributed to farms in Scotland, and no case of foot-and-mouth disease occurred in that part of Meath from which the eighty bullocks had come.

A case somewhat identical in character to the above occurred on November 30, also at the port of Dublin. During the examination of animals prior to their shipment to Manchester, a heifer belonging to a lot of forty-six cattle was found to exhibit a healing abrasion on the upper surface of her tongue, near its tip. The lesion was almost similar in appearance and in age to that found in the case of the bullock already referred to. The mucous membrane had been removed, and the lesion was in a semi-healed state and not unlike that which might arise from foot-and-mouth disease. The heifer was otherwise in normal health. All the animals comprising the lot about to be shipped were critically examined and found perfectly healthy. The heifer, with others brought forward for shipment on the occasion,

had been purchased a couple of days previously from a cattle salesmaster, and had grazed for several months on his farm in the County of Meath, at a place distant many miles from the lands from which the bullock referred to in the preceding case came. It was not considered that the case was one of foot-and-mouth disease, but having regard to the fact that the Department were in correspondence with the Board of Agriculture and Fisheries respecting the somewhat similar case discovered at the port two days previouly, it was determined to slaughter the heifer and to prohibit the shipment of the in-contact animals. These animals were accordingly detained and isolated. The heifer was slaughtered and her tongue kept available for examination by the Board's veterinary officers, if they so desired. The facts of this case were communicated to the Board, who sent one of their veterinary inspectors to Dublin. He examined the isolated animals and the tongue of the slaughtered heifer on December 2. He found no disease among the cattle, but expressed the opinion that the heifer to which the tongue had belonged suffered from foot-and-mouth disease, and at his request the tongue was despatched to the Chief Veterinary Officer of the Board for his examination. Meanwhile, immediate and exhaustive inquiries had been made at and about the farm in the County of Meath from which the heifer and other animals had been moved, first to the Dublin market, and then to the port for shipment. A large number of cattle with which the heifer and her companions could have come in contact were critically examined, and full inquiries instituted, but nothing whatever was ascertained which would at all support the conclusion arrived at by the officials of the Board of Agriculture as to the existence of foot-and-mouth disease.

In order to support the view taken by the Department's officers in connection with this case, the tongue of the heifer was shown to Professor Mettam, M.R.C.V.S., who, whilst unable to say that the condition exhibited did not arise from contagious foot-and-mouth disease, considered it might be due to pseudo-foot-and-mouth disease, having regard to the history of the case, of which he was informed.

No appearance of the disease occurred among the isolated in-contact animals. They were kept under daily observation until December 19, when the Board of Agriculture and Fisheries

(NEWRY-BIRKENHEAD CASE.)

Portion of the mouth of a bullock shipped from Newry to Birkenhead on December 3, 1912.

a, *a*, injuries to lips caused by broken tooth. *b*, broken tooth opposite injury to lip.

intimated that they no longer objected to their shipment to Great Britain. The cattle on the farm in Meath, where this heifer came from, were placed under restrictions, and inspections of them were subsequently made, but no disease occurred among them.

The lesions as observed in the two foregoing cases were not in an early or acute stage. As already mentioned, they were semi-healed, and consequently the diagnosis was much more difficult than if they were seen in their early development. They might readily be mistaken for lesions of foot-and-mouth disease, especially in the absence of the histories of the cases—but the circumstances strongly indicated that they resulted from a form of stomatitis distinct in character from foot-and-mouth disease. Other cases of the kind were on a later date discovered at Belfast port, when an opportunity was afforded of observing the development of the lesions, with the result that no doubt remained as to the malady being entirely different from foot-and-mouth disease. The circumstances are as follows:—

On February 14 a lot of eighty-seven cattle arrived at the port of Belfast from the County of Tyrone. They were intended for shipment to Ayr. On veterinary examination being made, however, seven of these animals were found to suffer from stomatitis, the lesions of which were abundant on the muzzles, outer and inner parts of the lips, and on the tongues of the cattle. On the upper surface of the tongues of three of these cattle, near the tips, large patches were observable. These were covered with necrosed tissue (entirely different from vesicles). The necrosed tissue was easily removed, and where this was done a reddish coloured surface was exposed. There were no feet lesions, and the animals exhibited no constitutional symptoms of illness. The Department's Portal Supervisor at Belfast, who considered the animals were not affected with foot-and-mouth disease, detained the entire lot of eighty-seven cattle and asked for instructions. One of the Department's senior veterinary inspectors, who was specially familiar with foot-and-mouth disease during the recent outbreaks, was at once despatched to Belfast, and he corroborated the opinion of the Portal Supervisor as to the absence of foot-and-mouth disease.

As the animals were intended for shipment to Scotland, the Board of Agriculture and Fisheries were communicated with, and their superintending veterinary inspector examined the

cattle two days subsequently. I was present during this examination. The muzzles, lips, and tongues of the animals still exhibited distinct lesions of stomatitis. The necrotic tissue which covered the larger patches on the tongues of the three cattle had been removed, and the abrasions produced were fast healing, showing lesions practically similar to those observed on the tongues of the County Meath cattle referred to in the two preceding cases, although the healing process had not at that time advanced quite so far as was observed in the Meath cases. The remaining eighty cattle forming the lot were examined, with negative results. The eighty-seven cattle had been kept for weeks on farms in the County of Tyrone, immediately before being moved to Belfast. All animals remaining on these farms, or which could have come in contact with animals thereon, were without delay critically examined and found to be healthy.

After being communicated with by their superintending veterinary inspector, consequent on his examination of the cattle in Belfast, the Board of Agriculture and Fisheries informed the Department to the effect that they had no objection to the exportation of the animals. The Department, however, decided to defer shipment, and kept the cattle under observation. The lesions healed in a comparatively short time and more rapidly than is usual in foot-and-mouth disease. The malady did not extend to any of the other cattle in the lot.

Measures were taken by the Department, under strict conditions of isolation, with a view to inoculate other cattle with material taken direct from the affected animals, but with negative results. This disease is possibly of a fungoid origin.

On December 3 the s.s. *Iveagh* sailed from Newry for Birkenhead, having on board 73 cattle, 143 sheep, and 525 swine. All of these animals prior to shipment had been under the observation of the veterinary inspector at Newry for a considerable time. Nothing was noticed amiss with any of them, and accordingly the veterinary inspector issued the requisite certificate for the shipment of the live stock to Birkenhead. These animals were all intended for immediate slaughter and in accordance with the then existing arrangement none of them were "mouthed" when being inspected. On December 4 the Board of Agriculture and Fisheries informed the Department by telegram that their veterinary inspector at Birkenhead had found

one of the cattle belonging to this cargo to be affected with foot-and-mouth disease, and in a further communication on the following day the Board stated that their veterinary inspector reported the discovery of four more cattle affected with the disease among the cargo, but that the sheep and swine were all healthy.

On receipt of the first intimation from the Board, immediate steps were taken to locate the places where each of the seventy-three cattle came from before being shipped from Newry. These places, which are situated in the Counties of Armagh, Monaghan, and Tyrone, were quickly located. All animals remaining on them were found free from disease, but, as a matter of precaution, their movements were restricted by service of special notices. In the communications from the Board some misapprehension appears to have at first existed as to the ownership of the five cattle reported to be affected with the disease, but subsequently it was learned that all of these animals belonged to one dealer, who shipped a total number of twenty-seven cattle to Birkenhead on the occasion, and it was then ascertained that four of the affected cattle, including the animal first detected, were obtained from two farms in the County of Armagh, and the remaining animal from a farm in the County of Tyrone.

Immediately after information was received from the Board of Agriculture and Fisheries as to detection of the disease at Birkenhead, one of the Department's senior veterinary inspectors was instructed to proceed at once to London and examine the lesions of disease found to exist in the case of the animal which was first detected at Birkenhead, it having been learned that the parts of the animal on which these lesions were situated had been forwarded to the Board's offices at London, and, on reaching the Board's offices, the inspector was shown certain conditions on the tongue (which had arrived from Birkenhead) said to be lesions of foot-and-mouth disease. The portions of the remaining four cattle regarded as exhibiting appearances of the disease had not at the time reached London, but, at the request of the Department, the parts showing the lesions of the first case discovered, and subsequently of the remaining four cases, were forwarded by the Board of Agriculture and Fisheries to the Department for examination. These consisted of the tongue and upper lip (with gum attached) of the first animal detected at Birkenhead, and the upper and lower lips (with gums attached) of the other four

cattle. On examination at the Department it was found that the lesions exhibited in each case were not those of foot-and-mouth disease. The tongue (of the first animal detected at Birkenhead) showed elevations and peeling off of superficial epithelium, but no exposure of the corium, such as occurs in foot-and-mouth disease. A like condition was more or less observable on the lips and gums forwarded (except in the case of one set of lips where the abnormalities were evidently due to injuries produced by the animals' teeth).

Meantime, the places in the Counties of Armagh and Tyrone where the twenty-seven cattle belonging to the dealer had been obtained, were again visited by the Department's veterinary inspectors, and, on a farm near the town of Armagh, where one of the five cattle said to have been affected with foot-and-mouth disease had come from, it was discovered that in the mouths of four of the seven cattle grazing thereon patches of superficial epithelium were peeling off, presenting conditions practically identical with those regarded as foot-and-mouth disease at Birkenhead. The lesions were seen in different stages. Brown-coloured markings first appeared on the surface of the tongue, and from these markings thin layers of superficial epithelium peeled off in patches, but no vesicles were formed at any time, and no soreness of the tongues or other parts of the mouths was noticeable. (It was ultimately observed that the superficial layer of epithelium completely peeled off the tongues of the animals.) No feet lesions were present. There was a complete absence of any constitutional disturbance, and the animals appeared to be in no way inconvenienced by this trifling ailment. Four cattle from the farm in question had been shipped on the occasion to Birkenhead. One of these four animals was originally bought from another farmer in the district, and it was discovered that on this man's land also this peculiar condition of the mouth existed among his cattle.

There were strong grounds to conclude that this ailment, although not being foot-and-mouth disease, was of a contagious character, and in order that further corroborative evidence might be obtained to negative the possibility of it being foot-and-mouth disease, experiments on other animals (including swine) susceptible of foot-and-mouth disease with material from the mouths of the affected cattle were decided on. In these experiments

Professor Mettam, M.R.C.V.S., co-operated. These experiments produced, in the mouths of the cattle inoculated, conditions similar to those described above as occurring on the farm near Armagh, but no lesions of foot-and-mouth disease resulted, nor were there any constitutional symptoms of illness. The actual organism causing this condition in the mouths of the cattle was not discovered, but experiments with a view to its discovery are being continued.

Foot-and-mouth disease is an eruptive fever characterized by the production of vesicles, and it is important here to emphasize the fact that no fever existed and no vesicles were present in the case of the naturally infected animals, nor in those infected by artificial means on the farm near Armagh.

The existence of this ailment among cattle in the County of Armagh, and its identity with the condition observed in the animals said to have been affected with foot-and-mouth disease at Birkenhead, was brought under notice of the Board of Agriculture and Fisheries, who were invited to send one of their veterinary officers to Armagh to investigate the subject on the spot. As a result, one of the Board's principal veterinary inspectors arrived at Armagh on January 1, and after investigation he concurred in the views of the Department's veterinary officials that the ailment in question was not foot-and-mouth disease.

Owing to the prohibition of the exportation of cattle from the port of Derry, consequent on the supposed discovery of foot-and-mouth disease among animals at Birkenhead, cattle intended for shipment alive from Derry were slaughtered at the public abattoir in that city, and their carcases, as well as offal, forwarded to Glasgow. On December 10, certain tongues of cattle slaughtered in these circumstances were shipped from Derry to Glasgow, and on the 12th of same month the Board of Agriculture and Fisheries telegraphed to the Department that their Veterinary Inspector at Glasgow was sending to their laboratory "three heads of Irish cattle brought over dead, apparently recently suffering from foot-and-mouth disease." A further telegram was received from the Board on the following day in reference to these heads, to the effect that their Chief Veterinary Officer was of opinion that the lesions were those of foot-and-mouth disease. On receipt of the first of these telegrams immediate steps were taken to locate the farms from which the three

animals as well as ninety other cattle came, it having been ascertained that all of them belonged to the same consignment and were slaughtered at Derry. The ninety-three cattle, it was discovered, had been kept on several farms in the Counties of Derry, Fermanagh and Leitrim, and these were located without delay, but it was impossible, owing to the absence of any information as to which cattle of the lot the three tongues actually belonged to, to locate definitely the place or places from which the three animals had been taken, but they had been moved from some of the farms located. Searching inquiries were at once made as to the possible existence of foot-and-mouth disease on any of these places, or in the neighbourhood of same, and a large number of animals were examined on the lands, but with a negative result.

At the request of the Department, the Board of Agriculture and Fisheries forwarded to Dublin the three tongues (with parts of jaws) which had been received from Glasgow. On arrival the three tongues and such parts of the lips as remained were examined and found not to exhibit lesions of foot-and-mouth disease. The conditions on the tongues were identical with those observed in the case of the cattle shipped from Newry to Birkenhead on December 3, and with the affected animals in the County of Armagh, as already referred to.

The lesions observable on the tongues and lips of the Newry-Birkenhead and Derry-Glasgow cases showed characteristics entirely different from those seen on the tongues of the two cattle from the County of Meath slaughtered at the port of Dublin and mentioned in the preceding cases.

D. S. PRENTICE.

APPENDIX B.

REPORTS ON EXPERIMENTS CONDUCTED IN CONNECTION WITH THE SUSPECTED OUTBREAK OF DISEASE IN COUNTY ARMAGH.

In connection with the condition observed in County Armagh and which is identical with that found to exist on the tongues, gums and lips of the cattle shipped from Newry to Birkenhead, and the heads of cattle forwarded from Londonderry to Glasgow, it was deemed desirable to demonstrate by experiments that the affection concerned was not foot-and-mouth disease. These

experiments commenced on December 17, and were carried out principally by Mr. Norris, M.R.C.V.S., with the co-operation of Professor Mettam.

(1) *Preliminary Report by Professor Mettam.*

By instruction of Mr. Gill, Secretary to the Department of Agriculture and Technical Instruction for Ireland, I, on December 16, accompanied Mr. Prentice to Armagh, and on the morning of the 17th examined a number (seven) of animals on Mr. Baxter's farm at Luggyvallen, Armagh. These animals had been in contact with an animal seized at Birkenhead and declared infected with foot-and-mouth disease. I found to all appearances the animals to be in good health; they were feeding and thriving, there was no lameness, no salivation, nothing to attract attention. The animals were "mouthed." Five of the animals showed more or less loss of epithelium from the tongue or the upper gum or from both. The epithelial loss was quite superficial, being removed in flakes, which were of a dirty yellow-brown colour. The epithelium could be removed readily by the finger-nail. The flakes were perforated with minute apertures, through which the papillæ of the tongue had passed. There was no soreness of the tongue or gums. The corium or connective tissue was not exposed. There was no congestion. The temperatures of all the animals were taken and found to be normal. I do not hesitate to say these animals are not infected with foot-and-mouth disease, and since the first examination I have seen and examined these animals on three further occasions, and the subsequent examinations confirm the opinion formed on the first inspection.

I also examined, and have re-examined, four animals belonging to Mr. Lynas at Ballygassoon, affected with a similar condition of the lining of the mouth. These animals are in the best of health, feeding and thriving. There is no salivation, no lameness, no elevation in temperature, no depression. These animals are certainly not infected with foot-and-mouth disease.

Further, the above opinion has been confirmed by certain experiments which have been carried out, details of which will be supplied later and when completed. (The experiments have been made upon young cattle and swine. Similar experiments are now proceeding in sheep. The condition of the mouth has been reproduced in every detail, and there has been no

(NEWRY-BIRKENHEAD CASE.)

Portion of the mouth of a bullock shipped from Newry to Birkenhead on December 3, 1912.

a, part of dental pad and lip from which a thin layer of superficial epithelium has been removed.

constitutional disturbance, and nothing developed suggesting that the infection is foot-and-mouth disease, not even the production of the vesicles.)

I have also examined the specimens forwarded to the Department—tongue and lips of one animal, and subsequently the lips of four animals from Birkenhead—and in my opinion the condition found is precisely similar to that found in the animals examined in Armagh. In one set of lips, however, the lesions observed were injuries due to the teeth.

(2) *Report by Professor Mettam and Mr. Norris.*

Nature of the Disease.

Before describing the experiments it might perhaps be well to briefly give an outline of the lesions and nature of the disease met with in County Armagh.

The lesions appear on the mucous membrane of the lips, the dental pad, and on the tongue. In no case have lesions been seen on other parts of the body, and where they have been extensive upon the lips advancing towards the hair-bearing skin, they have not extended upon the skin. The lesions are therefore apparently limited to the mucous membrane of the mouth.

The Lips.

Upon the lips exfoliation of the epithelium is observed. The size of the lesion varies as does its outline. It appears very rapidly, generally about the size and shape of a kidney bean, and gradually extends. The superficial epithelium is lost, and bordering the lesion an irregular ragged fringe of loosened epithelium, outlined by a dark brown line, limits its extent. The lesion may commence anywhere upon the mucous surface, but generally near the commissures or angles, and then extends across towards the middle line. It may extend upwards towards the junction of skin and mucous membrane and even on to the muzzle, the lesion then becoming roughly triangular in outline, but it does not extend upon the skin. It must be emphasized that the loss of epithelium is superficial. The shreds are as thin as cigarette paper. There is no exposure of the corium or connective tissues, there is no pain, tenderness or soreness, or congestion. Never at any time was any vesicular eruption seen on the lips, merely this superficial epithelial loss and the dark brown line marking the limits of the lesion.

Similar lesions may be observed on the pad, but the exfoliated epithelium appears to be somewhat thicker than that seen on the lips. Exceptionally, the lip lesion may extend backards upon the mucous membrane of the cheek, just within the commissure or angle of the mouth. In no case was a typical lesion seen on the mucoues membrane of the lower lip.

The Tongue.

The lesions on the tongue commence as brownish, even dark brown spots, on the mucous membrane, generally circular in shape, and in size from a threepenny piece to a sixpence. They may arise in any part of the dorsum of the tongue, usually at about the junction of the fixed and free portions of the organ. The brown spot increases in size, and is but slightly elevated above the general level of the mucous membrane. There is no vesicular eruption. There is no fluid beneath the dark spot. The epithelium gives way and is removed in thin flakes perforated with apertures through which the papillæ passed. If a number of lesions have developed, they become confluent and then an irregular area or several irregular areas from which the epithelium has been lost may be observed on the same tongue. The lesions generally extend towards the tip. No lesions have been found posterior to the buibous swelling of the tongue. It also extends laterally, but apparently not to the under surface of the tongue. The last epithelium to persist is that covering the large papillæ on the dorsum about an inch posterior to the tip of the tongue. The lesion only affects that portion of the tongue carrying horny papillæ. The epithelium is easily removed during handling of the tongue; adherent or partially detached flakes may readily be taken away, and they resemble on a small scale pieces of perforated zinc. In time the whole of the dorsum and sides of the tongue lose the horny epithelium, and the tongue becomes remarkably soft and clean, resembling the tongue of a newly-born calf. Before the tongue reaches this condition, however, and before it has lost all the covering epithelium, dirty brown lines, somewhat raised, running in different directions, may be seen. These are the remains of the old epithelium at the confluence of the lesions, and sooner or later they are removed. The time required for epithelium to be removed entirely is about from ten to fourteen days, or less. Apparently the tongue may again

become re-infected. Cases have been noticed where the brownish spots have re-appeared on a tongue from which the horny epithelium had been removed. The spots evidently were of the same character as those occurring during the primary infection, but they are not so well marked and do not spread to the same degree.

The majority of animals affected are two years old or under, and there is some reason to believe that adult animals are not attacked to the same extent. There are no clinical symptoms. The animals do not salivate. There is no smacking of the lips, soreness of the mouth, nor lameness. To all appearances the animal enjoys normal health. There is no rise in temperature, and the appetite and rumination are in no way interfered with; in fact, the condition is only detected when the mouth is opened and examined.

From the nature of the infection—its course and its results—it is apparent that the condition is one of little importance, and that veterinary practitioners are seldom or never called in to treat it.

The Experiments.

The infective material used in these experiments was obtained from two separate farms, and, for the purposes of reference, the material from one may be designated virus "X" and that from the other virus "Y." Fortunately, ample accommodation for carrying out the experiments was available on one of these farms. The primary object in view was to determine whether the affection observed in the animals in County Armagh was foot-and-mouth disease or not, and, for that purpose, the following experiments were carried out:—

Experiment A.—Four young calves from 4 to 5 months old were, on December 17, inoculated in the following manner with virus X:—

The virus was obtained by scraping the tongues and removing the loosened epithelium by means of a Volkmann's spoon. The material thus obtained was rubbed down in a mortar with sterile normal saline solution. The emulsion obtained was then filtered through ordinary filter paper to remove coarse particles which might block the needles.

Calf 1 received 3 c.c. of the emulsion directly into the jugular vein. This animal remained in normal condition until the sixth

day after, when a slight superficial lip lesion was noticed. On the eighth day some lesions appeared on the tongue. These lesions in no way resembled those seen in foot-and-mouth disease, but were identical with those described in the earlier part of this report. The lesions progressed over almost the entire mucous surface of the upper lip and on the dorsum of the free portion of the tongue. The animal was slaughtered on the twelfth day for the purpose of obtaining its tongue and upper lip as museum specimens. This animal did not develop the mouth lesions as a result of the intravenous inoculation, but from repeated manipulation of the mouth by soiled hands subsequent to the inoculation.

Calf 2 received 3 c.c. of the same emulsion as Calf No. 1, directly into the peritoneum. This animal remained in normal condition until fifteen days after, when brown spots were distinctly noticeable on the tongue, and lip lesions appeared about the same time and extended on to the dental pad. The lesions in no way resembled foot-and-mouth disease, and by the twenty-fourth day after inoculation the lesions had practically disappeared. Like in the case of Calf 1, the mouth infection doubtless occurred from the handling which the animal was subjected to during the necessary manipulations for examination.

Calf 3 was inoculated by rubbing the emulsion used in Calf No. 1 upon its scarified upper lip and pad. Four days afterwards typical brown lesions appeared on this animal's tongue. Lip lesions appeared on the fifth day. The lesions progressed in the usual way. The animal was slaughtered on the tenth day after inoculation, to obtain its tongue and lip as museum specimens.

Calf 4. This animal's tongue was scarified on the dorsum and also on the under surface of the organ, and the emulsion rubbed into the scarification wound. Three days afterwards lesions were found on the dorsum of the tongue in the neighbourhood of the scarification wound. Lip lesions appeared a day or two later. The lesions progressed and by the fourteenth day after inoculation the superficial epithelium was completely exfoliated from the tongue and lip. Faint secondary lesions appeared on the tongue afterwards.

No attempt was made to isolate these four calves or keep them separate. They were allowed to freely mix and feed from a common supply. They were frequently handled after other animals suffering from the disease, no precautions being taken

XUM

to prevent transmission of disease during manipulation, the sole object being to set up the disease in the calves. In no case, however, did anything arise, nor was there the remotest suggestion that the condition was foot-and-mouth disease, nor did the lesions produced resemble that affection in any of its salient characteristics.

It having been determined that the disease was inoculable, and that the lesions were confined to the mouth, it was resolved to continue the experiments in other cattle, and in sheep and pigs.

Experiment B.—Two yearling cattle (Nos. 5 and 6) and one pig (No. 1) were, on December 21, inoculated by rubbing the upper lip, pad and tongue of each of the cattle, and the palate and tongue of the pig, with sandpaper impregnated with virus Y. In the case of the two cattle, lesions appeared on the tongues and lips about the fourth day after inoculation. The lesions were characterized by superficial exfoliation of epithelium, and did not resemble foot-and-mouth disease. In the case of the pig no reaction whatever occurred, although the animal was kept under close observation for three weeks afterwards.

Experiment C.—Two yearling cattle (Nos. 7 and 8) and one pig (No. 2) were inoculated on the same day and in the same manner as the animals in Experiment B, with material obtained from the lesions set up in Experimental Calf No. 4 (virus X). Lesions appeared on the lips and tongues from the third to fifth day in the case of the cattle. These lesions were not those of foot-and-mouth disease, but simply showed superficial loss of epithelium.

In the case of the pig no reaction whatever was shown, although the animal was carefully examined every day for three weeks afterwards.

Experiment D.—Two young sheep (Nos. 1 and 2) were inoculated by having their tongues, lips and palates rubbed with sandpaper saturated in virus X and Y. In the case of Sheep No. 1, virus X from Experimental Calf No. 4 was used, and in the case of Sheep No. 2, virus Y from Experimental Animal No. 5. No reaction whatever was noticed in either of the sheep, although they were kept under observation for sixteen days after the date of inoculation.

Experiment E.—As the virus of foot-and-mouth disease is ultramicroscopic, and so small that it will pass through a fine

(NEWRY-BIRKENHEAD CASE.)

Portion of the mouth of a bullock shipped from Newry to Birkenhead on December 3, 1912. *a*, part of dental pad and lip from which a thin layer of superficial epithelium has been removed.

porcelain filter, an experiment was made to see if such a filter would retain the virus of "Armagh disease." Accordingly scrapings were taken from lesions of the latter disease (which had already proved to be infective by inoculation), macerated with normal saline solution, and the emulsion passed through a Berkefeld filter. The filtrate thus obtained was then used to inoculate the lips and tongue of Calf No. 9. This animal was kept under daily observation for fourteen days afterwards, but no lesion whatever resulted from the inoculation, thereby proving that although the virus of foot-and-mouth disease is a filter passer, the virus of Armagh disease is not.

It having been proved by the foregoing experiments that the disease was easily transmissible to healthy young bovines by direct inoculation on the mucous membrane of the mouth, further experiments were designed to test the contagiousness of the condition by association of healthy with affected animals.

Experiment F.—Two healthy calves (Nos. 14 and 15) were placed in two separate stalls with two animals (Nos. 17 and 16 respectively) showing lesions of Armagh disease. The healthy and affected animals freely mixed together, and fed from a common supply, every opportunity being given to the healthy animals to contract the disease by association, if such were possible. On the ninth day of the experiment very slight lip lesions appeared in calves Nos. 14 and 15, and persisted up to the twenty-first day, when they had completely disappeared. The lesions were at no time well marked, and no tongue lesions were observed in either animal, although they were kept under observation for three weeks.

Experiment G.—Another experiment was carried out by placing two healthy calves, Nos. 12 and 13, in a field with eight affected animals showing mouth lesions in various stages of development. It should be pointed out that the field on which this experiment was made had been carrying animals affected with Armagh disease for some weeks previously. Typical well-marked lesions of the disease appeared on the lips and tongues of calves Nos. 12 and 13, on the eleventh and twenty-fifth days, respectively, of the experiment. In reckoning the results of this experiment it must be remembered that it was not a simple "association" experiment of affected and healthy animals; there are additional factors to be considered, in that it was possible

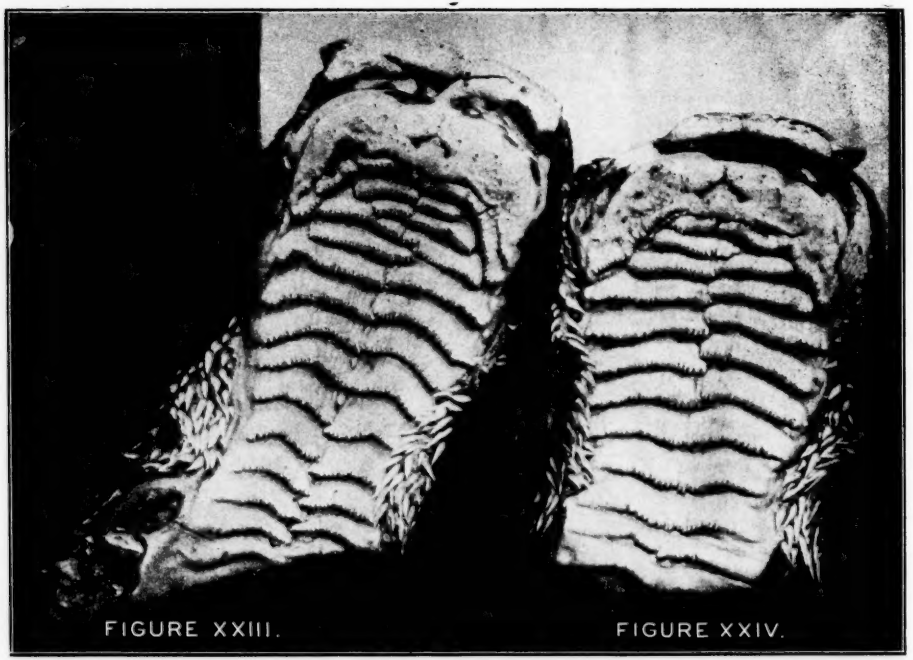

FIGURE XXIII. FIGURE XXIV.

(DERRY-GLASGOW CASES).

Dental pads and portions of palates and lips of two cattle slaughtered at Londonderry and sent to Glasgow on December 10, 1912. (The lips have been partly cut away in process of dressing.) The parts are devoid of Foot-and-mouth disease lesions.

that the healthy calves became affected from the previously contaminated pasture, or that the source of infection was in the pasture itself.

Conclusions.

From the above experiments it will be seen that thirteen cattle, two pigs, and two sheep were inoculated in various ways with the virus of this disease, and that in no case was foot-and-mouth disease set up. It will be observed that all the cattle which reacted showed typical lesions of the disease found among the cattle in County Armagh, and which were identical with those exhibited by the cattle condemned at Birkenhead.

It is very important to note that no reaction whatever occurred in the sheep or pigs, although these animals are highly susceptible to foot-and-mouth disease. Clearly, these experiments prove that the disease is not foot-and-mouth disease.

An endeavour was made to isolate the causal organism of Armagh disease. From cultures obtained from scrapings of lesions, various organisms were isolated and their pathogenic effect tried on susceptible animals. In all seventeen experiments were carried out. Six of these were with mixed cultures obtained directly from lesions. Nine were cultures of various *fungi* (including an aspergillus), one a culture of a micrococcus and one a culture of a bacillus. The results in all cases were negative.

STUDIES ON GROWTH: THE INFLUENCE OF DIET ON GROWTH, NORMAL AND MALIGNANT.

By CASIMIR FUNK.

(From the Department of Chemical Physiology, Cancer Hospital Research Institute, London.)

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The idea of influencing the growth of tumours by diet is not a new one. Jensen pointed out in 1909 that the diet plays an important *rôle* in the growth of tumours, and especially in the formation of metastases. Haaland has found that mice kept on a diet consisting of cotton seeds, bread, oats, and milk were less resistant to an inoculated sarcoma than mice kept on a restricted diet of bread and oats. These results were corroborated and extended by Stahr, Moreschi, and Medigreceanu. Rous has

observed that mice kept on a diet of oats and rye-flour, maize, milk, and sugar in a quantity just sufficient to sustain life show a different behaviour when they are inoculated with tumours before or during this restricted diet. In the first case on animals with large tumours no effect could be noted; in the second case the growth of the tumour was slightly inhibited. These papers, however, dealt with the influence of diet as a supply of nutriment in general. Ehrlich's atreptic theory expounded in 1906 the interesting view that tumours require a specific food supply. Thus he considers that the reason why a mouse tumour fails to grow for any length of time in a rat is due to a lack of specific food supply. The important work of Osborne and Mendel, Hopkins, and recently McCollum and Davis, has taught us to regard the growth, besides being due to a supply of nutritive constituents in general, as due to a specific "growth substance." Early in 1913 I pointed out that these results, together with the gain in our knowledge as regards the vitamines, new important constituents of our normal dietary, cannot fail to produce some effect on the investigation of cancer, and described experiments in this new direction.

Since then two references in the literature dealing experimentally with the same subject can be found. The first paper is by Sweet, Corson-White, and Saxon, who have described some experiments on mice and rats on normal diet and such devoid of vitamine. The latter diet had undoubtedly an inhibiting effect in the case of mice, where the percentage of takings was decidedly smaller, the incubation period longer, and the tumours smaller than in the case of normal diet. On the contrary, when rats were used very little effect was noted. The second part of this interesting work seems, unfortunately, to contradict the above-mentioned results. The second paper was by Hopkins, which corroborates the results of the American authors. In his cases also the inhibition of the tumour growth was not a complete one. We see from these experiments that it is possible to inhibit the growth of tumours to a small extent, and a question arises whether this could not be applied for therapeutic purposes. We must state here from the beginning that this is as yet hardly possible, and the reasons for these conclusions will be discussed in this experimental paper.

I have recently found that the diet used for the inhibition of

growth, which consists of caseinogen, starch, sugar, fat, and salts, produces in pigeons typical beriberi, and therefore must be regarded as devoid in vitamines. A similar diet can be obtained by using polished rice or a food sterilized in autoclaves at a high temperature. We know, however, that such a diet would unavoidably produce in man in the first case beriberi, in the second case scurvy.

Lately I succeeded in arresting the normal growth of young chickens for the first time on a diet containing vitamines—namely, on red (unpolished) rice—a statement which will be corroborated in this paper. Here was a new hope for influencing the tumour growth without danger of producing a deficiency disease. I therefore inoculated the chickens arrested in growth with Rous's sarcoma, a very virulent chicken tumour which takes in nearly 100 per cent. The result was that the tumour grew undoubtedly more slowly, and was smaller in size than in controls on normal diet. The chickens died sooner than those not inoculated, although no metastases were found, which are very frequent in Rous's sarcoma, an observation which might, perhaps, suggest a greater avidity of the tumour for the food than that of the normal tissues. It seems, therefore, that the growth of tumours and the normal growth of young animals are, although to some extent analogous, not quite identical. The tumour seems to have a much more active metabolism, its avidity for food is greater than that of a normal tissue. These experiments must be considered as a series of orientation experiments in an endeavour to influence the tumour growth by diet. At the present time they do not admit of a practical application, but they suggest that, especially in cases of a quickly growing but not very malignant tumour, such a diet might have some slight inhibitory effect on the rate of tumour growth without producing a deficiency disease.

This work is being continued on broad lines to ascertain the influence of the various constituents of food on tissue growth.

Experiments.

In my first communication on the same subject I have described some experiments on 14-day-old chickens (Plymouth Rocks) in which I have arrested growth completely by means of an exclusive diet of red (unpolished) rice. The longest time it

was possible to keep alive these stunted chickens was two months. A photograph (see figure) illustrates very well the size of such chickens compared with that of those on normal food. The addition of white bread to the red rice had no effect on the growth of the chickens. I hope to be able to keep the chickens with arrested growth alive for longer periods by a slight addition of some foodstuff to the diet.

Experiment 1.—In my first communication the results of tumour inoculation in chickens with arrested growth were not

Showing the arrest of growth in a chicken fed on red (unpolished) rice. Age of chicken, 2 months.

recorded. In this experiment eighty-four chickens were used, which were divided into seven batches—namely:—

1. 12 Chickens on red rice.
2. 12 ,, ,, ,, { Inoculated after 33 days of the diet with Rous's chicken sarcoma.
3. 12 ,, ,, ,, { With addition of the same sarcoma extract to the food.
4. 12 ,, ,, ,, { Addition of sarcoma extract, and inoculated after 33 days of this diet with the tumour.
5. 12 ,, ,, ,, { Addition of yeast to the diet, and inoculated after 33 days.
6. 10 ,, ,, Spratt's chicken food.
7. 9 ,, ,, ,, ,, ,, Inoculated after 33 days.

The result of the inoculation will be seen in the next table:—

Number of batch	Number of chickens alive at the time of inoculation	Number of birds bearing tumours	Diameter of tumour
2	5	1	¼ cm.
4	5	2	¼ cm.
5	7	5	1 cm.
7	9	8	3·7 cm.

In all these cases except the last no metastases were observed. From this experiment we see very clearly the effect of the addition of Rous's sarcoma and yeast to the diet of red rice, and the fact that no metastases were found must be especially emphasized.

Experiment II.—For this experiment sixty-seven 14-day-old chickens (Plymouth Rocks) were taken, the initial weight of which was 60 grm., in contrast to the previous experiment, in which 80 grm. was the average. They were bred late in the season, and were much more delicate and more difficult to keep alive. The chickens were divided into four batches, one of which was inoculated with the chicken sarcoma on the ninth day of the diet, instead of the thirty-third as in the previous experiment, a time in which the stock of vitamines from the food previous to the experiment could hardly have been completely used up, a fact which accounts largely for the results obtained. The results of the second experiment are summarized in the following table:—

	Not inoculated		Inoculated	
Days	Number of chickens living	Average weight	Number of chickens living	Average weight
0	24	58 grm.	24	60 grm.
4	24	59 ,,	24	62 ,,
8	24	50 ,,	24	58 ,,
12	17	53 ,,	20	52 ,,
16	11	67 ,,	4	58 ,,
20	10	60 ,,	3	57 ,,
24	5	66 ,,	2	55 ,,

In all the inoculated chickens a tumour developed, except in four which died early. This shows that a diet consisting of red rice for nine days previous to inoculation does not prevent the tumour taking, and the growth of the tumour does not influence the growth of the chicken. But the *post-mortem* examination has shown that the tumour was in all cases, except two where it reached the size of 1½ cm., extremely small, and measured only ½ cm. on the average. Here, as in the previous experiment, no metastases were observed. The death-rate of the chickens inoculated between three to eight days was a very great contrast compared with the controls.

In another two batches the influence of the addition of phospho-tungstic filtrates from rice polishings and yeast and the influence of the isolated yeast vitamine was also studied with a view to ascertain in which fraction of these foodstuffs the growth vitamine is to be found. The results are recorded in the next table: —

Number of chickens	Days of Experiment	Average weight	Nature of addition	Number of chickens	Days of experiment	Average weight	Nature of addition
9	0	58 grm.	PWS-filtr., yeast	10	0	58 grm.	Phospho-tungstic acid filtrate from rice polishings.
9	4	56 ,,	,,	10	4	58 ,,	
9	8	59 ,,	,,	10	8	59 ,,	
9	12	55 ,,	,,	10	12	53 ,,	
9	16	55 ,,	Vitamine 2-5 mgr. daily	8	16	58 ,,	
8	20	57 ,,	—	8	20	61 ,,	
4	42	65 ,,	—	5	24	60 ,,	

In this experiment the addition of the phospho-tungstic acid filtrates was given instead of water and the vitamine injected intramuscularly. The result obtained shows that the phospho-tungstic filtrate fraction from foodstuffs is not likely to contain the growth vitamine, and suggests that the latter substance is likely to be chemically different from the beriberi vitamine. A slight effect was, however, observed as regards the time that one was able to keep the young birds alive.

Experiment III.—The next experiment was performed with the view to determine the influence of vitamine-free diet on the growth of Rous's sarcoma in chickens. As vitamine-free diet polished rice was chosen; the inoculation was made sixteen days after the beginning of this particular diet. Of twelve animals taken for the experiment, of which eleven were alive at the time of the inoculation, five showed tumours $\frac{1}{2}$ cm. in diameter, with the exception of one tumour which reached the size of 3 by $1\frac{1}{2}$ cm. In none of these cases were metastases found.

Experiment IV.—The same experiment was repeated on a larger scale, controls being used which were fed on polished rice, with a small addition of yeast. For this experiment fifteen chickens (Plymouth Rocks, as in the previous experiments), aged 3 months, were used and were inoculated eight days after the commencement of the particular diet. The result was the follow-

ing: Of fifteen chickens fed on polished cooked rice only, inoculated, none developed a tumour. In the case of addition of yeast, of thirteen chickens alive at the time of the inoculation, from the same tumour as the polished rice birds, eight developed tumours varying in size from 1 cm. to 3 cm. without showing traces of metastases. Experiments on rats inoculated with Jensen's sarcoma showed that a similar diet had identically the same effects as was observed in fowls inoculated with the Rous's sarcoma.

This whole experiment shows undoubtedly the great influence of vitamine-free and vitamine-containing diet on the growth of Rous's sarcoma.

Experiment V.—The experiments of Murphy and Rous and Murphy have shown that it is possible to implant Rous's sarcoma into eggs containing chicken embryos and also in the eggs of pigeons and ducks. This shows that either the egg of any species is able to nourish the tumour, or that the embryo has not acquired yet the power of resistance to implanted tumours of foreign species. It was thought that one-day-old pigeons, having perhaps a store of embryonic substances, would be susceptible to Rous's sarcoma. Sixteen one-day-old pigeons bred in the institute were inoculated with Rous's tumour on the second day after their leaving the shell; none, however, have as yet developed a growth. The experiment is being continued.

ACTINOMYCOSIS OF THE MAMMARY GLAND IN DAIRY HERDS IN VICTORIA.*

By E. A. KENDALL, B.V.Sc.
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Mr. President and Gentlemen,—Having been honoured with an invitation to submit a paper on so auspicious occasion as this is to the veterinary profession in Australia, I have been prompted to select as a subject that of "Actinomycosis of the Mammary Gland in Dairy Herds in Victoria." This was done for several reasons, the foremost being the apparent rarity of its occurrence in other parts of the world where the dairying industry has been

* Read before the Australasian Association for the Advancement of Science, at the Melbourne Meeting.

long and extensively established, the dearth of information as to its incidence, and the somewhat remarkable extent to which it is met with in this State.

That it is rarely met with elsewhere is indicated by the facts that only four cases, according to Le Blanc and Nunn, have been observed by Bang and Rasmussen, though the former saw fifty-three cases of mammary actinomycosis in sows in three months. Maxwell has seen eight centres of infection in one cow. Professor Mettam refers to it as uncommon. Jensen, however, appears to have met with it more extensively, as he mentions it as being of comparatively frequent occurrence; and it is recorded by Winslow as appearing in nodules or the miliary forms of actinomycosis.

The discovery of the prevalence of this disease in the udder in the dairy cows in this country dates from the inception of the local statute known as "The Milk and Dairy Supervision Act," which became operative in 1906. This Act was designed for the express purpose of enabling rational supervision of the health of the dairy herds as well as all dairying operations to be exercised by the Government. The staff charged with the carrying out of the provisions of the Act consists of dairy supervisors and veterinary inspectors. Amongst other duties the former make frequent periodical examinations of the cows supplying milk, particular attention being paid to the condition of the udders. Any departure from the normal state of this or other regions warrants the supervisor in prohibiting the use of the milk of a cow for fourteen days pending an examination of the animal by a veterinary officer. If no morbid lesion is present this officer removes the prohibition. If a disease, such as mammitis, for example, exists, he may extend the period of prohibition sufficiently long to enable recovery to take place; and in the event of some malignant lesion being detected, such as tuberculosis or actinomycosis, the prohibition is made permanent, and the cow is condemned for milking purposes and fire-branded. Though not necessarily summarily destroyed, a cow so prohibited and branded becomes, to all intents and purposes, the property of the State, the owner being held responsible for her safe keeping. In the event of a condemned cow being in a favourable condition for fattening for slaughter, the owner, subject to certain restrictions, may be granted the privilege of dealing with her in this

way, and she is subsequently killed under expert supervision, when a systematic *post-mortem* examination is made, and a report furnished thereon.

It is necessary at this juncture to point out that an actual diagnosis of the condition of the udder or other regions is not made by nor expected of the supervisor. He merely reports the presence of any abnormality. The diagnosis, therefore, rests with the veterinary officer solely. These facts are mentioned in order that no misconception may arise as to the qualification of the officer who is responsible for the diagnosis on which action as regards the future of the cow is taken.

I also desire to make it clear that, although a cow has been permanently prohibited and branded by the responsible official for some malignant disease, the statistics showing the number of cows, together with the particular diseases for which such action was taken, are not completed until the cow has been slaughtered and an autopsy performed. This is of great importance regarding the observations made as to the prevalence of actinomycosis in the mammary glands, because it removes any possible suggestion of error which would necessarily have to be considered if the diagnosis of the disease in some hundreds of cows was not subsequently confirmed on *post-mortem* examinations.

As might have been anticipated when inspections of dairy herds were systematically and thoroughly carried out on an extensive scale, a very large number of cows were temporarily prohibited for various conditions which necessitated veterinary examination, and a considerable proportion of these were so prohibited for udder troubles. The first impression received was that there must be a great deal of tuberculosis of the mammary glands in Victorian dairy herds, and, indeed, on subsequent examination by veterinary officers, this actually appeared to be the case, for there were a great many cows affected with nodular conditions in the udder which were in no small degree consistent with the general character of those of tubercular lesions in that region. So commonly were these nodules met with, and their existence doubted by the owners of condemned cows, that it was the practice at the outset, in order to afford instruction on their nature and significance and encourage early destruction of the cows, to have such cows killed in the presence of the owners,

so that the nodules could be demonstrated to them personally. The outcome of this procedure, though interesting enough from a pathological standpoint, was often disconcerting to the officers. Whereas the nodules, as a general rule, were comparatively easily revealed in the living animal, it frequently happened that they were not correspondingly easy to demonstrate when slaughter took place a few days or weeks afterwards. This naturally suggested that the nodules were certainly not tubercular, and that, whatever they were, a partial resolution appeared to have taken place in the interval. The former view proved to be correct; the latter was, however, soon dispelled, for on incising the nodules in numbers of cases the characteristic sand-like particles seen in actinomycotic nodules, surrounded with a small quantity of pus, were exposed. Further proof that these were truly actinomycotic was forthcoming when microscopical examinations of a number of sections of similar nodules were carried out by the Director of the Bacteriological Department of the University of Melbourne, Dr. R. J. Bull. It is hardly necessary to add that interest in the work of supervising the health of dairy cattle increased considerably as a result of the discovery.

Symptoms and Diagnosis.—As regards symptoms generally, I may say that, so far as outwardly visible signs are concerned, they are usually conspicuous by their absence. Beyond an enlarged or hypertrophied quarter or quarters of the gland in some instances, or an atrophied condition in others—neither of which is of material diagnostic value, as both occur as the result of mammitis—there is nothing to draw attention to the condition. Indeed, in a large number of cases there is no variation whatever in the external appearances of the glands. Diagnosis, therefore, depends mainly on palpation.

To examine a cow for the presence of these lesions it is necessary to adopt a regular line of action. The milk should be first withdrawn from the udder, and while maintaining the posture of the milker, each quarter of the gland is manipulated in detail. This is done by fixing them with one hand, and moving the fingers and thumb of the other upwards and downwards, forward and backward over the surface of the gland tissue. By this means the nodules are easily located, and diagnosis determined by their situation and character. In a typical case they will be found in the connective tissue surrounding the smaller cul-de-sacs of the

galactopherous sinus and acini, and when present in large numbers they are distributed fairly evenly throughout the greater part of the gland. Occasionally they appear to be situated much nearer the surface of the gland tissue, and can be felt almost subcutaneously. They vary in size from a leaden shot to a split pea, and usually stand out in prominent relief from the surrounding tissue. They are quite firm, and inclined to roll away from the fingers under slight pressure, and at the time when they can be detected with any degree of certainty there is practically no pain evinced on manipulation. In fact the impression received on feeling these nodules with the fingers and thumb may be aptly likened to that of a cow who had received a spreading charge of large leaden shot in the udder. This "shotted" condition is so characteristic in the majority of cases that the detection of mammary actinomycosis by the veterinary staff can fairly be claimed to have become second nature.

The most commonly affected regions of the udder are the two posterior quarters, and when the lesions are unusually extensive they may be found reaching almost to their very base. So far as the secretion of the affected quarters is concerned, provided they are not entirely atrophied, inert, or "blind," there is no material alteration in its physical properties. It may be less rich in fatty solids, and a smaller quantity is yielded, as is frequently the case with the so-called "weak" quarter after an attack of mammitis. From what has so far been stated in regard to symptoms and diagnosis, it might be too readily taken for granted that there is little or no difficulty in detecting this disease in the udder. It is, however, by no means easy in all cases. From an extensive experience in this work, I am convinced that we have yet to determine to what stage the pathological processes have reached by the time we can detect the lesions so certainly. I shall have more to say on this a little later. It will suffice here to point out that it is quite possible that these lesions have been in existence for some time previous to our finding them in the form of characteristic nodules I have just described. Their presence may have been disguised by some earlier inflammatory process with its attendant hardness and swelling. At all events, this possibility is recognized to the extent of sometimes withholding permanent prohibition pending a further examination later, when the nodules have assumed the more typical character, and can therefore be more certainly detected.

Differential Diagnosis.—The principal diseases of the udder which might be confused with mammary actinomycosis are fibrosis, mammitis, and tuberculosis. The first is distinguished by hardness and thickening of the connective tissue, which is linear, and more or less continuous in character, rather than interrupted and nodular. If the surface of the indurated tissue is studded with numerous convexities suggestive of nodules, it will be noted that these are strongly connected or linked together with bands of the connective tissue. They, as a matter of fact, more closely resemble tubercular conditions than actinomycosis, being somewhat irregular in size, larger and less sharply defined. They are doubtless old inflammatory foci left after an attack of mammitis.

Mammitis.—Parenchymatous and catarrhal.—Assuming for the moment that these diseases are themselves not connected with actinomycotic infection, as I shall discuss a little later on, there is little difficulty in differentiating them. The intense and almost uniform hardness and swelling met with in the former variety of mammitis cannot well be confused with the clearly defined, shot-like, or miliary nodules of actinomycosis. From the catarrhal form distinction is less easy, particularly in the convalescent stages, when the inflammatory foci in the galactopherous sinus, acini and milk ducts are very prominent and hard. These foci are, however, usually much larger than the miliary nodule of actinomycosis. Another rather useful distinguishing feature is the exhibition of a varying degree of pain or pressure in catarrhal mammitis, which is not usually appreciable in the case of the actinomycotic nodule.

From mammary tuberculosis actinomycosis is often difficult to distinguish. The affected portions of a tubercular mammary gland are, however, much harder in addition to being nodulated. The nodules themselves are large and less uniform in size and frequently more densely packed together. There is also, as a general rule, some evidence of accompanying lesions in the supra-mammary lymph glands, as revealed by their general increase in size, hardness, and also by their nodular condition. In actinomycosis of the udder these glands are very rarely altered in appearance in any way. In spite of these distinguishing characteristics, the line in some cases between the two diseases is so finely drawn that it becomes necessary to utilize the tuber-

cular test as an aid to diagnosis. When applying the test for this purpose, an important thing must be borne in mind. While the possibility of the nodules being tubercular would be at once eliminated on failure to obtain a reaction, it would not necessarily be proved that they were, because a cow with a nodulated udder did react. It might so happen that reaction was due to a deep-seated tubercular lesion elsewhere and the cow was free of similar lesions in the suspected udder. The inference to be drawn from this is that either the nodulated condition is merely due to indurated gland tissue, or, what is by no means unlikely, actinomycosis.

Except that it is obviously more creditable to be able to diagnose the character of the lesion localized in the udder, it does not greatly matter whether they are tubercular or actinomycotic; permanent prohibition follows in either case. A cow reacting to tuberculin is also condemned for milking purposes irrespective of where the lesions are situated.

Post-mortem Appearances.—On removal of the skin of an affected udder there is little to be noted other than the altered conformation of the glands in some instances; in others there is no departure from the normal. When an incision is made into the invaded tissue, however, the nodules, though usually appearing smaller than the impression received of them when manipulated *ante-mortem*, stand out quite distinctly from the cut surface. It will also be observed when the tissue is being incised that the nodules escape injury unless very thickly clustered. When exposed to view they are hard and firm owing to the presence of a fibrosclerous wall. This wall is often more or less translucent, showing the appearance not unlike that of a small serous cyst. The tissue in the immediate neighbourhood of the nodule is generally little altered in consistence, though occasionally it may be indurated. On incising the nodules the typical yellowish or greyish-yellow sand-like particles of actinomycosis, together with a little pus, may be easily pressed out. Under the microscope these particles are found to be composed of the characteristic degenerated or involuted forms of the streptothrix actinomyces. They are even better demonstrated on examination of a section of the entire nodule stained by Blaut's or Gram's method. Along with the "clubs" are also commonly seen the coccus-like bodies, generally regarded as broken filaments of the fungus, and also some staphylococci.

I now come to what may be looked upon as one of the most interesting features in connection with the finding of these lesions in the mammary glands. To begin with, I should state that no compartment or quarter, or quarter of either right or left gland, is immune from invasion. Any one or all four may be involved. The two posterior quarters are, however, attacked with much greater frequency. Further, a comparison between the number of right posterior quarter infections and those of the left posterior region reveals an appreciable increase of the latter over the former. In support of these statements I purpose furnishing figures showing the total number of cows actually destroyed during the past 5½ years which were found on *post-mortem* examination to have actinomycotic udders. I have expressly excluded a large number of cows permanently prohibited and branded for this complaint which have not yet been finally disposed of by slaughter in order to eliminate any suggestion of error in diagnosis. During the period mentioned 636 cows have been killed under supervision with actinomycotic udders. The proportions in which these were affected in regard to the individual quarter or quarters is as follows:—

Region.	No. of cows.	Percentage.
All four quarters	22 ...	3·3
Both right ,, ...	32 ...	5
,, left ,, ...	17 ...	2·6
,, anterior quarters ...	5 ...	·78
,, posterior ,, ...	68 ...	10·69
Right anterior quarter ...	41 ...	6·5
Left ,, ,, ...	28 ...	4·4
Right posterior ,, ...	175 ...	27·5
Left ,, ,, ...	248 ...	38·99
Total ...	636	

It is necessary for the purpose of preserving due accuracy to mention that there were, in addition to the foregoing, a few cases in which there was what might be termed "cross infection," that is to say, where the right anterior and left posterior, also left anterior and right posterior, were jointly involved, but the number was so small as to have no material bearing on the greater frequency generally with which it appeared in right as

compared with the left gland or anterior with posterior quarters: I have therefore not included them.

When an analysis of these figures is made one is at once struck with the great preponderance of posterior infections. If we take the total of these regions, that is to say, right and left individual posterior together with these cases where they were jointly affected, it will be seen that they represent no fewer than 491 out of a total of 636, or 77·2 per cent., whereas the two individual and joint anterior infections amount to only 74, or 11·63 per cent. With regard to two right and two left quarters infections, I think they may be reasonably left out of the calculations for the present, as they make little or no difference to the overwhelming majority of posterior.

Taking now the individual posterior regions only, it will be found that there were 178 cases in which the right one was involved, and 248 in the left. There is, therefore, an increase of 73 in the latter over the former, or 41 per cent.—a sufficiently wide margin to excite some comment.

Incidence of the Disease in the Udder.—Before offering some explanation of the peculiar significance of these figures, I will crave your indulgence while I endeavour to set out my views as to the circumstances connected more particularly with the incidence of this disease in the mammary apparatus of the cows in this State. One might be inclined to the view at first that the existence of so much mammary actinomycosis was due to generalized or secondary infection from some original source elsewhere in the tissues of the animal, notably, the maxillæ, pharyngeal region, lungs, &c. This theory is, however, quite untenable, owing to the fact that so far from the disease being commonly met with in any of the foregoing or other regions and the udder in the same animal it is quite the other way about. The mammary lesions, curiously enough, most frequently exist alone. The examination and original diagnosis in these 636 cows were made while they were in various stages of lactation. I do not, however, mean it to be inferred that the disease would not have been also found during the period while lactation was in abeyance. The probability is that there were and are as many cows not in milk affected as others, but it is not until another period of lactation commences that they come immediately under the notice of the supervisors and veterinary staff. In the case

of virgin heifers or any cows that have never borne calves, I do not think it is ever present, for reasons which I shall set out presently. Although I have just expressed the opinion that the disease is probably quite as prevalent in dry cows as in those in milk, I believe, nevertheless, that infection is very intimately associated with lactation; and so much so, that if the necessary physiological changes which result in the yielding of milk did not take place, it is not too much to say that there would be no such actinomycotic infection as that with which we are now dealing. The relationship between milk production and mammary actinomycosis may be explained in this way: There is no doubt that the so-called "ray fungus" is present on many of the cattle pastures in Victoria, as witness the extent to which actinomycotic lesions are met with in the mandibular and pharyngeal regions of cattle. Infection in these instances is undoubtedly due to portions of contaminated fodder plants wounding the soft tissues and even becoming embedded in them. It may, therefore, be reasonably assumed that any other part of a cow's body could readily become soiled on contact and actually infected if means of entry were found. With a cow in milk, what region is more likely to be exposed to infection than the mammary gland when in contact with the ground while the cow is in a recumbent position? It is not necessary that a wound shall be first inflicted, though undoubtedly there are many cases where external injury to the udder is followed by actinomycotic infection. The means of entry are already provided in the nipple itself.

The altered conditions of the udder as a result of preparation for the secretion of milk causes the lactiferous duct in the nipple to become more or less open or expanded, and when the cow is being milked the nipples are commonly moistened with milk, or it may be some other lubricant. When the operation is completed she is usually turned out to the paddock with moist or sticky nipples. She generally assumes a state of decubitus soon after being liberated, and infective material may readily adhere to the parts. It may thus gain access to the excretory duct, and by growth of the filaments reach even beyond the galactopherous sinus to the smaller ducts and acini of the gland, and thence to a more permanent home in the deeper connective tissue. I do not believe it to be essential in all cases that actual milk production

shall have commenced before infection can occur. The glands of cows of great milking propensities become greatly distended through springing for several days or weeks before parturition, and therefore their condition approximates that of the cow already in milk, in that the nipple is expanded and to some extent moist. Again, infection may just as easily occur in the case of cows being "dried off" when the gland is expanded through pressure of accumulated milk. Contrasting these circumstances with the barren dry cow and virgin heifer, we find that the orifice of the nipple is practically sealed up; the gland itself shrunken or undeveloped. Consequently invasion in the latter cases in the same way is impossible.

According to Muir and Ritchie, if we study the growth of the streptothrix actinomyces under artificial conditions, presumably because it can be seen best in this way, it will be found that filaments grow upward into the air. The protoplasm of these later becomes segmented and forms spores or conidia. Under natural conditions outside the animal body these conidia become centres for further filamentous growth. This being so it would seem quite feasible for similar processes to go on where the streptothrix or its filaments attach themselves to the orifices of the nipple, because in the presence of the moisture and warmth of the part it probably finds itself in favourable surroundings for growth. Seeking a continuance of such favourable conditions, growth could proceed along the milk duct into the interior of the gland and thence to the deeper regions. With the exception of the difference in the environment in the latter case as contrasted with that of natural conditions, it seems to me quite conceivable that the growth of the filaments and formation of conidia can proceed on similar lines to that occurring outside the animal body, for it must be borne in mind that, although it has reached the interior of the gland, until it is actually grafted to a part of the mucous surface, and invasion of the submucosa and connective tissue has began, the fungus is, to all intents and purposes, as much outside the body as if it were absent altogether. The theory of invasion in this manner might be disputed, because microscopic examination of the invaded tissue shows that the seats of the lesions are not actually in the acini or milk duct, but rather in the neighbouring connective tissue. I do not think this theory can be thus effectually disposed of. If it is contended that there ought to be some evidence on examining a section microscopically of invasion through the mucous membrane and other tissue along which growth of the fungus has proceeded, the same contention ought to apply whatever has been the source of entry, as, for example, infected skin wounds in the region.

Indications of infection through skin wounds in the udder are just as deficient. My belief is that so long as there is practically no obstacle to the advancing growth along the mucous surface, such growth will proceed into the depths of the gland cavities till the fungus eventually grafts itself on the membrane in the more confined areas of the acini. Invasion of the surrounding connective tissue follows, and this in turn proceeds until some part more firm in texture is reached and the fungus becomes imprisoned there. To put this in another way, the filaments of the streptothrix sooner or later come to a "dead end," and their growth and formation of conidia are inhibited by the toughness of the surrounding connective tissue. They there set up tissue reaction resulting in the formation of the characteristic nodules of actinomycosis. The explanation of the absence of any lesions in the tissue invaded by the streptothrix *en route* to the parts where the nodules are eventually found is that a fungus so minute as the streptothrix may not dwell long enough in the tissues passed through to produce a reaction, and even if reaction did occur that it would be too infinitesimal to leave any discoverable trace.

Thus far I have been dealing with the possibility of direct infection of the normal udder. With a view to ascertaining whether it occurs as a sequel to some pre-existing morbid condition, I have on several occasions, when taking action, closely questioned owners and persons who know the history of the cow from birth upwards, and whose information could be relied on, as to the previous existence of any abnormal state of the udders. In some instances the reply was that nothing had ever been noticed amiss, and their first knowledge of anything unusual was gleaned from myself. Other persons remarked that the cow had had a weak quarter for some months previously, or that the quarter had been hard and painful for some time during the previous or present milking periods. This at least suggests that direct infection does follow other diseases in some cases, and that only comparatively slight disturbance is set up. On the other hand, the existence of some previous inflammatory condition in the same region indicates that the actinomycotic infection may take place as a result. It is a possibility that cannot be altogether dispensed with, because I have personally had under observation several cows originally temporarily prohibited by supervisors for mammitis. Prohibition was extended. Re-examination some months later revealed the existence of actinomycosis. One case in point was put aside for purulent mammitis on December 13, 1909. The cow was not seen again till October 28, 1911, when actinomycosis was diagnosed, the original

inflammatory lesions having almost entirely disappeared. She was finally killed on January 25, 1912, over two years afterwards, and *post-mortem* examination of the udder revealed well marked actinomycotic lesions. It may be reasonably supposed that if infection can occur in a normal udder, one damaged as a result of a purulent inflammatory process could still more easily be infected.

Actinomyces as a Cause of Mammitis.—There is yet another important feature to consider in regard to the relationship between mammitis and this form of actinomycosis. This is the likelihood that a mammitis indistinguishable by ordinary clinical methods from that commonly met with may really be the result of direct infection by actinomyces instead of being a predisposing cause of the latter trouble. Personally, I believe that this theory has much to support it, and that it cannot be dismissed as untenable. If we take the incidence of the disease in other regions, such as the jaw, we find that the characteristic lesions are there developed as a result of direct entry of some fungus—infected foreign substance; that in and around the actinomycotic tumour there are pronounced inflammatory or granulation tissue areas. The difficulty one experiences, however, is to estimate to what extent the inflammatory process and subsequent abscess formation are due to the presence of the fungus, and how far they are influenced by the presence of pus-forming cocci, for there is almost always abundant evidence of a mixed infection when smears or sections from a lesion are examined under the microscope. At all events, it does not appear rational to suppose that the inflammatory processes could be due to coccal infection alone; neither does it seem feasible that there would be no tissue reaction if the fungus was present without cocci.

It might therefore be held, with reason, that precisely similar inflammatory areas are actually set up in the gland tissue from entrance of the fungus by a natural opening instead of by a wound, and that the fungus subsequently grafted itself on the mucous lining of the acini or milk duct. So far as investigation has proceeded there would appear to be, however, a marked difference in the naked eye appearance of the two sets of lesions; whereas the actinomycotic tumour of the jaw or tongue is more conglomerate, or its nodules are more densely packed or blended together, the small, evenly-shaped, shot-like nodules in mammary actinomycosis are distinctly isolated, and stand out in bold relief from the surrounding tissue. Again, the tumour in the region of the head has a tendency to suppurate sooner or later. In the udder cases, while suppuration processes are present to a small degree in each nodule, there appears to be little tendency for them

to break away and discharge. The pus with the imprisoned clubs may remain inside the firm fibrosclerous wall of the nodule for an indefinite period—certainly for upwards of two years.

Thus far it would seem the pathological processes in the two forms of the disease were not identical; but I do not think it is by any means improbable that in a very large proportion of cases at least the characteristic inflammatory and pus-forming stages were actually present in the infected regions of the udder previously, and that they either passed away before the affected animal came under our notice with the typical miliary nodules, or that they escaped detection in an already acutely inflamed gland on account of its intense hardness and swollen condition and consequent difficulty of palpation. To put it another way, the case may have been recorded as ordinary purulent mammitis, when it was really the earlier stage of what should be termed actinomycotic mammitis. Further, though there was apparently no abscess formation, as in other regions, with subsequent evacuation through the gland tissue and skin, nevertheless, more extensive suppurative processes than we have so far seen may have occurred, and discharge already taken place by way of the galactopherous sinus through the main milk duct.

Still pursuing this line of reasoning, it is not irrational to suppose that consequent on escape of the pus, &c., the original lesion has, to all intents and purposes, healed, leaving the small well-defined miliary nodule with the firm fibrous wall containing the imprisoned clubs of the fungus, which we have found so abundantly, and which have been already described.

I regret that opportunities have been difficult to find for the purpose of following up these mammitis cases more closely, with a view to definitely deciding this important question of their causation by infection with the fungus. Other official duties, together with the fact that permanent prohibition and slaughter for *post-mortem* examinations cannot be carried out for mammitis alone under the Act, have militated against this work. However, I am not without hope that it will be possible to do more in this direction very shortly.

If I have not unduly taxed your patience thus far, I will now return to the figures of cases I have already quoted to you, and put before you reasons which I think in no small measure account for the predominance of posterior over anterior infection, *viz.*, 491 as against 74. In this respect I believe that the explanation will be found chiefly in the attitude assumed by the cow in decubitus. When a cow rests in the ordinary way the posterior quarters, particularly if well developed or very prominent, and the nipples are large, come much more in contact with the soil

and grass than is the case with the anterior. Even though all four compartments are well developed, there is less tendency for the anterior ones to be so exposed to infection, for the reason that the cow in decubitus is invariably resting with one hind leg partially extended under that part of the body, and consequently gives some support to the anterior quarters. Even though some part of these quarters is in touch with the ground, the direction of the nipples is readily altered to a forward direction by the leg and body, instead of downwards by the backward thrust given to the udder with the weight of the posterior region of the abdomen above and before it, and so keeps them from contact to a great extent.

With regard to the 41 per cent. of difference in numbers of individual post-quarter infections, *i.e.*, right and left, we must again look to the attitude of the cow when recumbent. You will recall the fact that I have stated my belief that infection is closely associated with the milking process. In this instance it is necessary to go a little further. It is well known, of course, that methodical dairy farmers endeavour to have their cows in full profit as long as possible, and one result of this is to put the cow to the bull again as early as deemed expedient after calving, in order that there will be as little time as possible lost between the cessation of one period of lactation and the commencement of the next. In many instances the cow is thus pregnant again very shortly after calving. Now, if one carefully observes a number of cows when comfortably settled down in a paddock ruminating under ordinary circumstances, it may be noted that the barren cow seems to prefer the right sterno-abdominal position of decubitus, presumably in order not to inconvenience the work of her capacious rumen, which she has no doubt very recently filled. On the other hand, if she is pregnant (and the further pregnancy is advanced the more marked is the tendency) she is more disposed to suffer some inconvenience, so far as her rumen is concerned, and adopt the left sterno-abdominal position, so that she may not expose the contents of the uterus to unnecessary harm by pressure and consequent displacement. It would be little short of gross exaggeration to say that all pregnant cows are so careful of their developing offspring as to adopt this procedure, for indeed they do not; but there is equally little doubt that a fair proportion of them possess this maternal instinct to an appreciable degree. I think, therefore, that this variation in the position of decubitus affords a feasible explanation of the difference in favour of left posterior infections.

Influence of Milk from Actinomycotic Udders on Consumers.

—Before concluding I desire to add some general remarks on the question of infection of persons or animals consuming milk from cows suffering from mammary actinomycosis. When it is remembered that there have been upwards of 600 cows destroyed on account of this disease, and others have been condemned, such a question most naturally arises. Up to the present there seems to be a considerable difference of opinion as to the probability of infection occurring from this source. Winslow is of opinion that the ray fungi may escape into the milk, which, if used for human consumption, may produce the disease. Jensen also thinks that man may be affected through the digestive canal, and that such a possibility of contagion must not be disregarded in controlling a milk supply. Mettam records that he is not aware of the organisms being found in milk, though I believe other observers have claimed the discovery of it in that product. Notwithstanding this, Mettam has no doubt that milk from an infected gland should be condemned; and in support of this he says that there are many cases of human infection on record, and that in most instances the disease enters by the alimentary tract. In some the infection was claimed to be direct, whereas in others the streptothrix was not evident. I have no knowledge of the statistics of cases in the human subject in this State which might be possibly attributed to the milk supply, but it is doubtful if they are, in any case, at all proportionate to the number of animals found affected. Even though the infectivity of milk from such a source were demonstrated, the danger would not appear to be really very great. Direct transmission by inoculation of material from an infected animal source is very difficult to attain, presumably because it is not easy to obtain the streptothrix in a satisfactory or suitable state for transplanting. Inoculation of human beings has, however, been traced to injuries to the mucous membrane of the lips and other parts of the digestive tract through persons chewing fungus-infected fodder plants (Kitt). It would seem that the environment the fungus finds itself in once it enters animal tissues inhibits its powers of successful transplantation direct to the tissues of other animals.

Dr. Gilruth has expressed the view that the clubs, being merely involuted or degenerated forms of the streptothrix, are incapable of being directly transplanted, and also that such involution process is largely influenced by tissue resistance, so much so that the greater the resistance to invasion by streptothrix the greater will be the club formation. This very probably throws some light on the almost entire absence of recorded cases of infection of the digestive tract of calves, which one would think

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ought to be fairly common, particularly when it is known that it is the practice with a number of dairy farmers to put calves with cows after the more acute stages of mammitis have subsided.

In spite of the conditions which are said to militate against direct infection of man and other animals, it appears probable that the fungus, on escaping from the animal tissues and finding accommodation on a vegetable host once more, is capable of acquiring the faculty of reinfecting an animal when the conditions are favourable. Thus it is probable also that infected animals are capable of spreading infection by contaminating pastures. For this reason, and because of the possibility of direct infection, it would undoubtedly be inadvisable to lessen the restrictions or vary the action at present taken in regard to cows affected with this disease in this State.

A PLEA FOR VACCINE THERAPY.

By W. MORGAN SCOTT, F.R.C.V.S.

Bridgwater.

Armed with my diploma and a fair knowledge of the actions and uses of drugs, I left college with the erroneous conviction that I possessed all the necessary essentials which go to make a successful general practitioner, and that I had only to diagnose my case, and prescribe a carefully selected base, adjuvant and corrective, and my patient would in due course recover. For some years this line of treatment was faithfully adhered to before experience taught me the way of escape from the fetters of a college training, and in looking through those early prescription books it is a surprise to me now that many of my patients survived the over zealous administration of drugs. As time went on I found my cases made better recoveries where drug therapy of a more simple and less aggressive character was adopted. Curative medicine is roughly divided into two distinct classes, allopathy and homœopathy, and the exponents of each naturally maintain their system to be the best. That drug therapy does occupy a position and sometimes an important one in the cure of bacterial diseases no one will deny, but that its action and uses are not to be compared with the natural forces already present in animal tissues we must all admit. Moreover, the very secondary position occupied by drug therapy accounts for the fact that the successful results obtained by the votaries of one line of treatment are equally secured by those who adopt another line of treatment, perhaps diagonally opposed. For example, we hear

of some practitioners adopting the sedative treatment in pneumonia with apparently good result, while others are carrying out the tenets of the stimulating treatment with an equally favourable termination. Another class of practitioner discards drug therapy *in toto*, and confines his energies to nutrients and good hygiene.

Again, take such a disease as tetanus. Here we find a series of cases treated on the most scientific principles giving a percentage of recoveries, and another series treated on the "do nothing" principle of treatment giving equally good results. It cannot therefore be claimed drug therapy is the *alpha* and *omega* of curative medicine. This being so, it must then follow that there exist in the animal body forces which are capable, independently of the skill of man, to battle against bacterial disease. These forces we now recognize as opsonins, agglutinins, precipitins, bacteriolysins, &c.

To assist Nature when she is unable for some reason or other to elaborate a sufficiency of these antibodies is the basis upon which all forms of curative medicine is built, and this man has done all through the ages, although in many instances the *modus operandi* has remained obscure, thereby giving another illustration of the many examples of practice preceding science. From what has been said it is apparent that drug therapy has very pronounced limitations, and I venture to think that the more these limitations are recognized the greater is the success assured to the practitioner. Let us notice briefly a few of the more common methods adopted in daily practice based upon our present day knowledge, and see how curative results are obtained.

Counter-irritants.—A rubefacient applied to the skin determines a greater supply of blood to the cutaneous and subcutaneous structures, and the older practitioners' theory was that by producing a superficial inflammation the pre-existing deep-seated inflammation was counteracted. We know now that a cutaneous inflammation determines an increased cellular activity, and the production of a greater supply of immune bodies which in specific visceral inflammation are necessary to thwart the progress of bacterial invasions.

Hot Fomentations and Poultices.—These have been used to combat disease from time immemorial.

The early practitioner believed that by their soothing influence they reduced inflammation. In the case of a local bacterial infection we find a spreading inflammation sets in caused by the endotoxins and exotoxins of the bacteria; phagocytosis, circulatory tension, coagulation, stasis and effusion take place: the

result is the part or parts are cut off from the general blood supply, and the bacteriotropic blood is unable to reach the infective foci. Here hot fomentations and poultices assist in dilating the capillary blood-vessels, relieving the tension and facilitating the transfusion of the antibody laden fluids, and in this manner renewed antibodies reach the bacterial foci to the detriment and destruction of the latter.

Stimulants.—There are no systemic stimulants capable in themselves of thwarting the destructive progress of pathogenic bacteria, but they may rouse tissue cells to increased activity in the elaboration of antibodies. Moreover, stimulants may and do sustain the vital organs, which in visceral infections where the excessive *accumulation* over *elimination* of toxins is feared. These toxins in themselves have a direct paralysing effect upon the cardiac and respiratory centres, not to mention the heart muscle itself.

Sedatives.—In superficial and visceral bacterial invasions with consequent inflammatory sequelæ such a sedative as aconite exerts at certain stages a beneficial effect upon the system in general by lowering the blood-pressure, beginning at the heart and extending to the arteries. This tends to lower the tension in the infective zone with the result that the body cells are restored to activity with a consequent increase of antibodies, while the body fluids are themselves given a better access to the focal area.

Eliminators.—During the development of all forms of the known pathogenic bacterial flora growing in or on the animal body toxins are produced derived from the bacteria themselves, and I am not sure if dead tissue cells do not contribute to toxæmia, particularly in such diseases, for example, as the carcinoma group.

Toxins in themselves are powerful depressors of the functional activities of the body cells, and their accumulation leads to cellular paralysis, cellular death and dissolution. To warn against such accumulation the practitioner must keep the eliminative channels free, *i.e.*, the bowels, kidneys, and skin: for the bowels an aperient, mag. sulph., or aloes; for the kidneys I know of no better agent than turpentine; and for the skin salicylate of soda, or better still salicylic acid. It will therefore be seen that eliminatives have a most important function to perform in bacterial invasions, and I think, so far as drug therapy is concerned, they should occupy the most important position in one's mind when prescribing for such cases with toxæmic symptoms. The foregoing is only a cursory glance at the limited influence drug therapy exerts in the treatment of bacterial diseases in general, and it is well for the clinician to keep these limitations before him.

Vaccine Therapy.—A bacterial vaccine may be defined as an albuminous substance made up of devitalized bacteria held in suspension, and when introduced into the animal body stimulates those tissues capable of elaborating antibodies. A vaccine, therefore, increases the natural resources which are existing in all living animals.

When living bacteria are introduced into the body there follows an immediate increase of antibodies, and it may here be asked, if this is so why does Nature fail in many instances to throw off the invading elements; in short, why is vaccine therapy necessary? There may be several contributory factors to account for this failure.

(1) The invading bacteria may be so numerous and virulent as to completely paralyse the immunizing mechanism. Anthrax is an example of this.

(2) An abundant supply of antibodies may be formed throughout the body, but owing to isolation of the bacterial foci, such as a purulent cyst, or the coagulation of a serous exudate, or the plugging of vessels with clot, these antibodies are unable to reach the infected zone. Quarter evil up to a certain stage is an apt illustration here.

(3) In the case of a local infection the area may be so isolated and incapable of producing antibodies itself, while the bacteria are unable in themselves to arouse other regions of the body more capable of elaborating immune bodies.

(4) The tissues of the body infected with bacteria may be so lowly vascular as to be incapable of responding to the bacterial stimulus. Examples of these are seen in the cartilaginous and ligamentous structures, *i.e.*, the poll, the sternum, and the lateral cartilages.

(5) Through some inherited or acquired defect the tissue cells in themselves seem incapable of responding to bacterial stimulus, with a consequent non-elaboration of immune bodies.

In the case of (1) the ideal treatment consists of administering an antitoxic and bactericidal serum.

In (2), where the practitioner is dealing with a cyst, this should be opened where possible and the cavity packed, after the walls have been curetted, with citrate of soda. This salt increases osmosis and prevents the coagulation of lymph. Here benefit can also be obtained by the internal administration of citric acid, and in local infections, as we have seen, hot fomentation relieves tension.

(3) In this condition the stimulation of antibodies is clearly indicated by the introduction of suitable autogenous vaccine.

(4) Here we have an opportunity of combining surgery

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with vaccine therapy. The infected area should be laid open and the parts curetted, the cavity irrigated with weak warm boric lotion, and firmly plugged with chloride of sodium and citric acid.

(5) The greatest benefits here are to be derived from the repeated injections of polyvalent vaccines and sera.

So much for the responsive virtues of the tissue cells, vaccine administration, and the difficulties which may be encountered in daily practice. There are other important points which must not be overlooked, referring particularly to the vaccines themselves. Briefly, these are as follows:—

(1) A vaccine derived from a young culture is much more efficacious than if obtained from an old culture.

(2) Over-sterilization by heat detracts from the therapeutic value of the vaccine. The usual temperature advised is 57° to 58° C. for three-quarters of an hour. In many cases I have satisfied myself by sterilizing for half an hour at 55° C., and believe I have obtained a more efficacious vaccine.

(3) The dose is an important consideration. If it is too small little or no benefit will accrue, and it is well to remember a much larger dose will be tolerated in chronic than in acute infections. If the dose is too large the negative phase, on the other hand, with its consequent depression, may be so great as to hasten dissolution.

(4) In the case of a mixed infection a vaccine should be obtained from each variety of bacteria present, for it is obvious a streptococcal vaccine would be of no value in a streptococcal infection, and vice versa. It is well to remember also in a specific disease running a course where mixed infection is the rule one sometimes finds a secondary invasion of a fresh type of bacterium takes place, upon which the original vaccines will have no good effect. The practitioner, therefore, in the event of the case not making satisfactory progress, should make a careful examination of the *materies morbi* at intervals, and, if necessary, prepare fresh vaccines.

(5) *Autogenous* vaccines possess innumerable advantages over *stock* vaccines, and it is only in those very acute cases where the delay entailed in the making of an autogenous vaccine is dangerous that the use of a stock vaccine is, as a rule, justified. Moreover, those who employ stock vaccines only pander to empiricism. Even if we are fortunate enough to obtain a stock vaccine derived from bacteria of the same flora as the infection we desire to combat it does not follow the strain is the same, and, should this differ, the efficacy of the vaccine is greatly reduced. Take, for example, streptococci. Some strains of this bacterium are very

virulent, while others appear to be more or less inert, so much so, in fact, that one might almost say they were non-pathogenic. A vaccine made from the former strain would prove of excellent curative value, while from the latter no beneficial results could be obtained. From a series of investigations recently carried out, I have come to the conclusion that the nasal mucosa of nearly every horse in apparent good health harbours non-pathogenic streptococci.

Following upon the research work of such savants as Pasteur, Metchnikoff, Ehrlich, and in this country Sir Almroth Wright and his followers, much valuable knowledge has been obtained upon the great principles of immunity, and it is to these principles vaccine therapy owes its foundation. That this foundation is scientifically sound no one will deny, and that the great curative value of suitable vaccines is only realized by those who use them and note the results. There is still much to be learned about vaccine therapy, and now is the time for the practitioner to seriously take up the subject so that he may keep in touch with the advancement being made all along the line. Better it is to ride on the crest of the wave of progress, though it may be rough, than to remain content in the dull waters of stagnation.

The day of the black draught and the red drench is slowly but surely passing away, and the dawn of a new era of scientific curative medicine is upon us. Let us hope the empiricism and commercialism of the older drug therapy will not extend to the newer vaccine therapy, although it must be confessed signs even at this early stage are not wanting of such an invasion extending into the realms of the latter. Now, the opportunity offers itself before irreparable damage is done for the State to step in and legislate with a firm hand.

Equine Clinicals.

A UNIQUE ACCIDENT TO A HORSE.

By EDMUND BURKE, D.V.M., F.L.S., F.Z.S.
Professor of Surgery, Punjab Veterinary College, Lahore, India.

THE accompanying photograph shows pretty clearly the nature of the accident, which is, I think, unique.

The subject, a six-year-old mare, was brought to the College hospital for treatment on February 15 last year, shortly after the accident occurred. As the injury was considered incurable the owner was advised to have the animal destroyed, which was accordingly done.

Photograph taken after the accident.

The owner stated that while he was out for a ride the mare got frightened at a passing motor-car and suddenly swerved round. In so doing she severely knuckled over at the near hind fetlock, which instantly caused the joint to burst open in front.

When brought to the hospital the mare walked on three legs, carrying the injured limb flexed up, with the digit dangling loosely

below, and the inferior extremity of the large metatarsal bone protruding through a wound in front of the fetlock. An examination of the injury showed that the skin and subcutanous fascia had been burst open to the extent of 3½ in., and the extensor pedis tendon was completely ruptured, while the anterior common and both lateral ligaments of the fetlock were stripped off the distal extremity of the large metatarsal bone.

That the injury was caused by a sudden and severe knuckling at the fetlock, as stated by the owner, was most probably the case, from the fact that the edges of the wound had an uneven and torn appearance, as also the divided ends of the extensor pedis tendon, and the ligaments were stripped clean off the metatarsal bone. The surface of the skin, at the site of the injury, showed no abrasion or other sign of having been knocked against any hard object.

TREATMENT OF FISTULA OF THE SPERMATIC CORD.

By JOHN HAMMERSCHMID, V.S.

Lemberg.

I HAVE treated a second case of fistula of the spermatic cord successfully by adopting the following procedure: Widen the fistulous canal, and free the spermatic cord as far as possible.

Then, with an ordinary wound syringe, Lugol's solution 1:5:100 is injected every other day through the fistulous opening into the scrotum, and massaged up and down with the hand. In order to keep the passage open the fistulous canal is repeatedly widened.

Besides this treatment, and in order to soften the spermatic cord, the scrotum is bathed twice daily for half an hour at a time with very warm 2 per cent. lysol solution. It is bathed in this way until cure results.—*Oesterreichische Woch. für Tierheilkunde.*

Reviews.

Annual Report on the Civil Veterinary Department, United Provinces, for the Year ending March 31, 1913. Printed by F. Luther, Superintendent, Goonit Press, United Provinces, Allahabad. Price 9d.

In this Report the Hon. H. R. C. Hailey, I.C.S., mentions the difficulties as regards recruitment for veterinary service owing to candidates having an objection to going to other provinces where the colleges are situated. Cattle breeding is being rapidly developed and the number of hospitals and dispensaries maintained by the district boards has increased considerably. A new laboratory for

research work is being erected at Lucknow and will meet a great need. Messrs. E. W. Oliver, M.R.C.V.S., and C. W. Wilson, M.R.C.V.S., made tours of supervision and inspection throughout the provinces. As showing the wide area to be controlled, the former travelled 555 miles by road and 18,268 miles by rail, and the latter, 6,678 miles by rail, and 350 by road. Training in inoculation is being provided at the veterinary colleges. A scientific association, called "The United Provinces Veterinary Medical Society," has been formed, and it issues a periodical in the vernacular, a pamphlet on "Surra" has been published and circulated, and Mr. Oliver has given a series of lectures on meat inspection to recently appointed health officers.

During the year 75,571 cases of contagious disease have been notified with a reported mortality of 24,602. Rinderpest has been far and away the most prevalent and deadly. Thirty-eight animals affected with glanders were brought to the notice of the Civil Veterinary Department; surra cases were very few, and only five cases of dourine were brought to light. Foot-and-mouth disease was widely distributed, and a remark is made that "a special commission on foot-and-mouth disease from England has been deputed to India to study the disease *in situ*." Tuberculosis among bovines has been investigated at Cawnpore, at the instigation of Mr. Oliver, and as a first step in the campaign against human tuberculosis. Stud bulls are maintained in thirty-six districts, and at the beginning of the year there were fifty-six stallions on the Government register. Mr. Wilson attended many of the fairs and shows and judged the exhibits.

There are sixteen veterinary inspectors and 162 subordinate officers on the veterinary staff. These men are insufficient to cope with the work, but continued progress has undoubtedly been made and the services of another Imperial officer will soon be necessary. Mr. Wilson's Report shows evidence throughout of strenuous activity in veterinary matters, and there is no doubt that splendid work is being done which could be made more effective if recruits came in plentifully and were efficiently organized.

The Hon. A. W. Pim, Secretary to the Government, in his short note at the end of the Report, writes: "The probable expansion of the Department gives increased importance to the need for removing the present difficulties in recruitment, and the question of establishing a veterinary college for this province, on which the expense of training in Lahore or Calcutta will be avoided, is now under the consideration of the Government." G. M.

The Bloodstock Breeders' Review. Printed and edited by The British Bloodstock Agency, Ltd., 26, Charing Cross Road, London, W.C. Price 2s.

This quarterly, devoted to the British thoroughbred, contains articles on "The Heredity of Blood-vessel Breaking in the Thoroughbred," "Three-Year-Olds—the best of their Years," "The Story of Barcaldine," a horse who was never beaten, "Racing in Australia," and various statistics, pedigrees, and stallion announcements. Mr. J. B. Robertson tries to show that blood-vessel breaking

in the thoroughbred is of a hereditary nature. His facts go far to prove his theory and seem more lucid than some of his conclusions, *e.g.* "weakness of the vessel-wall is a segregable unit character in the germ plasm, having for its alternative the normal condition."

This quarterly magazine, which is illustrated, is well got up and printed, and is of undoubted value to those interested in the British thoroughbred, whether as breeders, trainers, owners, sellers, or buyers. This number contains a portrait of Mr. Alfred Stedall, and a short account of the life of a man who rose from a dealer in ladies' mantles to a racehorse owner and liberal patron of the turf. G. M.

The Chemistry of Cattle Feeding and Dairying. By J. Alan Murray, B.Sc.Edin., Lecturer in Agricultural Chemistry at the University of Reading. Pp. xii + 343, 27 illustrations. Price 6s. net. Publishers: Longmans, Green & Co., 39, Paternoster Row, London.

This book has been written mainly for the use of students pursuing college courses in agriculture, and it is hoped it may be useful also to practical farmers who have some previous knowledge of chemistry. It is divided into four main parts, dealing with the constituents of plants and animals, the requirements of animals, feeding stuffs, and dairying.

The chemistry of plants is fully discussed in the first ninety-seven pages, and as an exposition of the analysis and composition of plants it leaves little to be desired; but we think it would have been more practical and interesting if the action of some of the digestive juices on the constituents of the plants had been described and referred to in this section. In reference to the French name for protein we see no mention of *azote*, a term frequently used in French literature. Part II describes the various processes of digestion, but in order to know how various foods are acted on in the digestive canal one has to be constantly referring back to Part I to ascertain their chemical composition. Chapter x, on dynamics, seems to be of more value to horsekeepers than cattle feeders and dairymen. The pages on milk production are good, and show that the quantity of the milk may be influenced far more than the quality by any system of feeding, and the larger the yield of milk the greater the amount of additional food required. The production of hard and soft butter is influenced to a great extent by the character of the food, in the former case foods rich in protein and carbohydrates being needed, and in the latter food rich in fats. Peas, beans, clovers, vetches, maize, &c., are suitable to produce hard butter, whilst pasture grass, wheat bran, linseed cake, rape cake, &c., favour soft butter production. The valuation of feeding stuffs and compounding of rations have chapters to themselves, and from them the practical feeder may learn whether his rations are economical and on right lines. The graphic solution of problems in feeding by the aid of a chart is an innovation in methods of feeding instruction, and the author claims for it the merit of simplicity.

The chapter on concentrated foods is one of the best we have read in the English language, but when one comes to want to know, say, the difference between thirds and fourths, or what "randan" is,

and the identity of some of the foods with strange names which figure in the present day bill of fare for cattle, one does not gain any too much information on the point. If farmers always called things by their dictionary names they could doubtless be easily traced in the pages of this book. We think it would have been better if the by-products of flour and oil mills had been included in the industrial by-products, and the composition of these by-products more fully given.

The section on dairying is, in our opinion, the best in the book, although the addition of a chapter on the falsification and adulteration of milk and its products might have followed very usefully. English literature is almost silent on this subject, and the detection of such faults is almost solely work for the chemist. The book concludes with quite an adequate index. We only hope the volume may accomplish the object of producing a more scientific race of cattle feeders, but much educational groundwork of the right kind has yet to be done in country districts before the first principles of this book can be assimilated. Notwithstanding the work of the agricultural colleges, we fear that the race of rule-of-thumb feeders will greatly preponderate for many years yet to come. G. M.

TENTH INTERNATIONAL VETERINARY CONGRESS.

A MEETING of the Committee appointed to select reporters was held at 10, Red Lion Square, W.C., on Friday, January 9, 1914. Present: Sir John McFadyean in the chair, Messrs. Banham, Carter, Garnett, Professor Mettam, Mr. Price, Major-General F. Smith, Sir S. Stockman, Major A. G. Todd, Professor Wooldridge.

MINUTES.

The minutes of the previous meeting were read and confirmed.

REPORTERS.

The Honorary Secretary reported the result of correspondence with the reporters invited, most of whom had accepted. In the cases of refusal he had written to others on the list recommended by the National Committees, and the list was now as follows:—

GENERAL MEETINGS.

(1) *Official Opening.*

(2) *Foot-and-mouth Disease.*

Reporters [those marked * have not yet replied]: Herr Geheimer Regierungsrat Dr. Nevermann, Berlin; M. E. Leclainche, Inspecteur-Général, Chef des Services Sanitaires au Ministère de l'Agriculture, Paris; *Dr. Mohler, United States Department of Agriculture; M. le Docteur Remmelts, Chief Inspector of the Veterinary Service, The Hague; Herr Professor E. Hess, in der Fakultat der Veterinarmedizin, Universitat,

Bern; Professor A. E. Mettam, Principal, Royal Veterinary College of Ireland; Dr. Josef Rudovsky, Landes Veterinareferent, Brunn, Austria.

(3) *Tuberculosis.*

Herr Professor Dr. Eber, Direktor des Veterinar Instituts, Leipzig; M. le Professeur Vallée, Directeur de l'Ecole Vétérinaire, Alfort; Professor Sir John McFadyean, Principal, Royal Veterinary College, London; M. G. Regner, Veterinary Department, Ministry of Agriculture, Stockholm; M. le Professeur de Jong, University, Leiden.

(4) *Epizootic Abortion.*

Herr Regierungsrat Professor Dr. Zwick, Kaiserliche Gesundheitsamte, Berlin; M. le Professeur Moussu, l'Ecole Vétérinaire, Alfort; Herr Sanitatstierärzt Sven Wall, Offentlicher Schlachthof, Stockholm; Sir Stewart Stockman, Chief Veterinary Officer, Board of Agriculture, London.

(5) *Public Control of the Distribution and Sale of Milk in the Interests of Public Health.*

Dr. A. D. Melvin, Chief of the Bureau of Animal Industry, Washington; Herr Geheimer Regierungsrat Professor Dr. von Ostertag, Direktor der Veterinarabteilung des Kaiserlichen Gesundheitsamte, Berlin; M. S. P. Nystedt, Erste Stadtierärzt, Stockholm; Mr. J. W. Brittlebank, D.V.S.M., M.R.C.V.S., Public Health Department, Manchester.

(6) *Closing Meeting.*

SECTION I.

Veterinary Science in Relation to Public Health.

(1) *Meat Poisoning: Its Pathogenesis and the Measures necessary to guard against it.*—Herr Professor Bongert, Tierärztliche Hochschule, Berlin; Schlachthofdirektor Dr. Hans Messner, Carlsbad; *Dr. Guillaume, Directeur de l'Abattoir de la Ville de Nice.

(2) *General Principles to be observed in the Inspection of Carcases and Organs of Tuberculous Animals with a view to determine their safety as Articles of Human Food.*—M. le Dr. Stubbe, Inspecteur Vétérinaire Général au Ministère de l'Intérieur, Brussels; M. Cesari, Vétérinaire Sanitaire de la Seine, Paris; Herr Obertierarzt Dr. Nieberle, Hamburg; *Herr Sanitatsveterinar Hy. Hansson, Stockholm.

(3) *Disinfection of Wagons.*—M. le Professeur Dr. E. Bidart, à la Faculté de Médecine Vétérinaire, Université, Buenos Aires; Herr Regierarzungsrat Dr. Titze, Kaiserliche Gesundheitsamte, Berlin; M. Rabieaux, Inspecteur-Général des Services Sanitaires aux Ministère de l'Agriculture, Paris; *Professor Meloni, Naples.

SECTION II.

Pathology and Bacteriology.

(1) *Johne's Disease.*—M. le Dr. Olaf Bang, Copenhagen; Herr Professor Dr. Miessner, Tierärztliche Hochschule, Hanover; Mr. A. L. Sheather, B.Sc., M.R.C.V.S., Royal Veterinary College, London.

(2) *Bovine Piroplasmoses (European).*—Herr Professor Dr. Knuth, Abteilungvarstcher im Hygienischen Institut, Tierärztliche Hochschule, Berlin; M. le Professeur S. von Ratz, l'Ecole Vétérinaire Supérieure, Budapest; Mr. W. G. Wragg, M.R.C.V.S., Laboratory of the Board of Agriculture, London.

(3) *Ultra-visible Viruses.*—Dr. K. F. Meyer, University of California, U.S.A.; M. le Professeur Panisset, l'Ecole Vétérinaire, Lyons; *Herr Dozent Dr. Pfeiler, Leiter der Abteilung für Tierhygiene am Kaiser Wilhelm Institut, Bromberg.

(4) *Distemper—Etiology and Vaccination.*—Herr Professor Dr. S. Sigismund Markowski, Tierärztliche Hochschule, Lemberg; M. Carré, Chef de Laboratoire au Laboratoire des Recherches du Ministère de l'Agriculture, l'Ecole Vétérinaire, Alfort.

SECTION III.

Epizootology.

(1) *Anthrax.*—Dr. W. H. Dalrymple, Louisiana State University, U.S.A.; Herr Dr. Aladar Lukacs, Laboratorium für Schutzimpfstoffe, Budapest; Herr Rektor und Professor Dr. J. Szpilman, Tierärztliche Hochschule, Lemberg; Major Holmes, Imperial Bacteriologist, Muktesar, India.

(2) *Swine Fever.*—Dr. Marion Dorset, U.S.A. Department of Agriculture, Washington; Herr Hofrat Rektor und Professor Dr. Hutyra, Tierärztliche Hochschule, Budapest; *Herr Bezerkstierärzt Dr. R. Frauenberger, Freistadt, Austria; *Herr Dr. Glässer, Repetitor an der Tierärztliche Hochschule, Hanover.

(3) *Glanders.*—M. M. de Roo, Inspecteur Vétérinaire Principal au Ministère de l'Agriculture, Brussels; M. Drouin, Vétérinaire Directeur de la Cavalerie de la Cie. Générale des Voitures de Paris; Herr Professor Dr. J. Schnürer, Tierärztliche Hochschule, Vienna; Mr. J. R. Jackson, M.R.C.V.S., Board of Agriculture, London; Herr Professor Dr. Peter, Landestierärzt, Hanover.

(4) *Sarcoptic Mange of the Horse.*—M. le Vétérinaire Principal A. Barrier, Paris; Colonel Butler, War Office, London; Herr Landesveterinareferent Theophil Halski, Czernowitz, Austria.

SECTION IV.

Veterinary Medicine and Surgery.

(1) *Anæsthesia.*—M. le Professeur Hendricks, l'Ecole Vétérinaire, Brussels; Dr. L. A. Merillat, Chicago, U.S.A.; Herr Professor Vennerholm, Tierärztliche Hochschule, Stockholm; Professor G. H. Wooldridge, Royal Veterinary College, London.

(2) *Laminitis.*—M. le Professeur Liénaux, l'Ecole Vétérinaire, Brussels; M. le Vétérinaire Principal Joly, du 9me Corps d'Armée, Tours; Professor James Macqueen, Royal Veterinary College, London.

(3) *Surgical Treatment of Roaring.*—Herr Professor Dr. Eberlein, Tierärztliche Hochschule, Berlin; Dr. W. L. Williams, Cornell University, U.S.A.; M. le Professeur Dr. Fontaine, l'Ecole de Cavalerie, Saumur; Mr. F. T. G. Hobday. F.R.S.E., F.R.C.V.S., London.

(4) *The Use of Drugs in the Treatment of Disease caused by Nematode Worms.*—M. le Professeur Van der Eckhout, l'Ecole Vétérinaire, Brussels; M. le Professeur Railliet, l'Ecole Vétérinaire, Alfort; Professor J. F. Craig, M.A., M.R.C.V.S., Royal Veterinary College of Ireland, Dublin; M. le Professeur Peroncito, R. Università di Torino Istituto di Parassitologie, Turin.

Section V.

Tropical Diseases.

(1) *Diseases transmitted by Ticks; their Classification, Treatment, and Prevention.*—*Dr. D. E. Salmon, Washington, U.S.A.; M. le Professeur J. Lignières, Faculté de Médecine Vétérinaire de l'Université, Directeur de l'Institut National de Bactériologie, Ministère de l'Agriculture, Buenos Aires; Sir A. Theiler, K.C.M.G., Director of Veterinary Research, Transvaal; Mr. C. E. Gray, M.R.C.V.S., Principal Veterinary Surgeon, Transvaal; *Dr. Paulo Parreiras Horta, Directoria do Service de Veterinaria, Rio de Janeiro.

(4) *Diseases transmitted by Winged Insects; their Classification, Treatment, and Prevention.*—M. Cazalbou, Vétérinaire en première au 7ome d'Artillerie, Rennes; Mr. R. E. Montgomery, M.R.C.V.S., Veterinary Bacteriologist, Department of Agriculture, Nairobi, British East Africa; *Dr. L. O. Howard, Bureau of Entomology, Department of Agriculture, Washington, U.S.A.; *Dr. Pinto Guedes, Rio de Janeiro; *Dr. Christino Cruz Filho, Rio de Janeiro; Professor A. Lanfranchi, Directeur Institut de Pathologie Veterinaire, Parma, Italy.

Lantern.

It was resolved that arrangements should be made for the provision of a magic lantern for the purpose of illustrating the papers where necessary.

The Honorary Secretary reported that he had received applications from certain gentlemen for permission to read papers unofficially on subjects other than those in the programme, and on the motion of Mr. Lawson, seconded by Mr. Barrett, it was unanimously decided that no additions be made to the programme as already arranged.

Delegates.

The Honorary Secretary submitted the following list of countries which had so far promised to send delegates to the

Congress: The Commonwealth of Australia, Bulgaria, Barbados, Belgium, Canada, China, Denmark, Holland, India, Luxemburg, Leeward Islands, New Zealand, South Africa, Western Australia.

ROYAL COLLEGE OF VETERINARY SURGEONS.

Fellowship Degree.

A meeting of the Board of Examiners for the Fellowship Degree was held at the College, 10, Red Lion Square, W.C., on Saturday, January 31, 1914. The following is a list of the successful candidates, together with the titles of their respective Theses :—

Richard Finch, "Milk ; its Diseases and Contaminations."

S. J. Motton, "The Surgical Sequelæ of Parturition in the Mare and Cow."

W. T. Brookes, "The Ante-mortem and Post-mortem Diagnosis of Bovine Tuberculosis."

Capt. G. B. C. Rees-Mogg, "Ovariotomy of the Domesticated Animals."

Charles Hartley, Jun., "Bier's Hyperæmia in Veterinary Practice."

The Examiners were Prof. J. Macqueen, Messrs. J. Malcolm and W. Woods ; Mr. W. J. Mulvey in the chair.

FRED BULLOCK, *Secretary.*

NOTE.—All communications should be addressed to 8, Henrietta Street, Covent Garden, London, W.C. Telephone, 4646 Gerrard. Telegrams, "Baillière, London."

Letters for the JOURNAL, literary contributions, reports, notices, books for review, exchanges, new instruments or materials, and all matter for publication (except advertisements) should be addressed to the Editors.

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Illustrations for reproduction should be in good black or dark brown on white paper or card.

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